OAKDALE MUNICIPAL AIRPORT MASTER PLAN / 2015

WADELL ENGINEERING CORPORATION

AIRPORT PLANNING ■ ENGINEERING ■ MANAGEMENT CONSULTANTS

OAKDALE MUNICIPAL AIRPORT

MASTER PLAN

1995-2015

AUGUST 1996

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TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF EXHIBITS

1. SUMMARY

The City of Oakdale, California, contracted with Wadell Engineering Corporation to prepare a general aviation airport master plan study utilizing a 90 percent Federal Aviation Administration grant under the Airport Improvement Program. The basic intent of the study is to evaluate existing airport facilities, to assess airport demand, and to prepare an airport master plan to accommodate the demand through the year 2015. This summary presents the objectives of the study, the approach utilized in the master planning process, the results of the analyses performed, and the recommendations for prudent and proper protection and development of the Oakdale Municipal Airport. This report is intended to be a useful technical document to allow the elected city official, city staff, FAA, and CalTrans Aeronautics Division to properly develop and protect the airport while enhancing its usefulness to the traveling public.

Study Objectives

Specific objectives of the study are to:

- Determine, in concert with regional planning criteria, a set of forecasts and facility requirements for the development of the airport, considering airport noise and safety issues.
- Describe the concepts and alternatives considered in the course of the study.
- Provide concise and descriptive planning information. The impact and logic of the recommendations can then be clearly understood by the community and public agencies charged with the approval and development of this plan.

Study Approach

This Master Plan covers the planning period of 1995-2015 and includes the following major components:

- Inventory of area planning efforts and background data.
- Forecasts of aviation demand, including the number of operations, aircraft types, and aircraft mix.
- Evaluation of the impact of development on adjacent land uses and on the community.
- Determination of facilities and improvements required to satisfy the forecast demand.
- Estimation of the costs of airport development.
- Recommendation of a plan for the ultimate development of the airport in accordance with community goals and increases in aviation demand.

This study becomes effective only after it has been evaluated, adopted, and implemented. The plan has been designed to accommodate changes in community goals and aviation trends as they develop, imparting flexibility into the planning process. Community participation is invited during all planning phases by the consultant and by the city. Agencies contacted during the course of the study include representatives of Stanislaus County, CalTrans, and the Federal Aviation Administration. Valuable points of view regarding the future of aviation in the area were generated through these contacts and are reflected in the study.

Findings

The Oakdale Municipal Airport is located southeast of the city of Oakdale, three miles from the city center. It is an excellent, well-constructed, general aviation facility occupying 117 acres with one runway serving single and twin engine aircraft, as well as an increasing number of turboprops and turbine-powered business jets. The airport has a non-precision instrument approach to Runway 10.

Approximately 35% of all aircraft owners at the Oakdale Municipal Airport are from Oakdale, and 44% from other parts of Stanislaus County. The remaining 21% are primarily from the neighboring counties of San Joaquin, Tuolumne, and Alameda. Presently, 55 aircraft are based at the airport. The total is expected to increase to 80 by the year 2015. Growth will occur in all categories of aircraft, especially turboprop and turbine-powered business jets. Runway operations will increase to 51,380 by the year 2015, all of which will be general aviation.

To meet increasing aviation demand and improve airport safety, additional facilities and reconstruction of existing facilities will be necessary throughout the planning period. The existing 3,020 foot runway does not adequately handle the lightest business jets. A runway extension to 4,400 feet total length and widening to 75 feet are needed to meet growing aviation demand and to improve safety. Increases in covered aircraft parking facilities will be required; the development of T-hangars for the storage of based aircraft are recommended in the Master Plan.

Airport plans depicting the airfield area, terminal area, and approaches to the airport and stage development plans depicting the capital improvement program were prepared. The plans explain how the growing needs of the Oakdale Municipal Airport can be met through the year 2015.

Stage I

The projects of the first stage of development, 0-5 years, are (1) land acquisition for the extension of Runway 10-28 to the east, (2) irrigation channel relocation and structures under the extended runway and taxiway, (3) earthwork and drainage for the runway extension, (4) extension of the runway 75 feet wide by 1,380 feet long with lighting, and (5) extension of the parallel taxiway system with lighting. Additional projects include development of T-hangars with taxiways and fuel farm replacement.

The Capital Improvement Program Cost Summary Table on the following page shows that the most significant expenditures during the 20-year capital improvement program occur in Stage I. These expenditures are needed for the runway extension, associated taxiway and lighting systems, and T-hangar development.

Stage II

The second stage of development, 6-10 years, includes (1) additional hangars with taxiways, and (2) a localizer/DME navaid.

Stage III

The third stage of development, 11-20 years, primarily concerns (1) additional hangar development, and (2) hangar taxiways.

The capital improvement program cost summary associated with the three stages of development is shown in the following table.

Capital Improvement Program Cost Summary
Oakdale Municipal Airport
(In 000's 1995 $)

Stage I (1995-2000)	$2,522,300
Stage II (2001-2005)	$512,500
Stage III (2006-2015)	$207,100
Total	$3,241,900
FAA/State Funds	$2,548,100
Local Funds	$693,800
Total	$3,241,900

Source: Wadell Engineering Corporation

The FAA grant program provides 90% grant funding for eligible projects. The projects that are not eligible are auto parking, hangar construction, and private facilities such as fixed base operators, hangars, and fueling systems.

A 20-year cash flow analysis was prepared to model the income and expense. The resulting operating profit was combined with the local share of funds to match FAA and State grants for development, and for construction of non-eligible facilities.

Recommendations

It is recommended that the City of Oakdale adopt the Oakdale Municipal Airport Master Plan, 1995-2015, and undertake the following steps:

- Use the Master Plan as City policy for development on and adjacent to the Oakdale Municipal Airport.
- Apply to the Federal Aviation Administration and the State of California for land acquisition and construction grants for facility expansion at the Oakdale Municipal Airport.
- Implement the development program at the Oakdale Municipal Airport, with emphasis on Runway 10-28 expansion and protection, installation of navaids.
- Apply for State of California aviation fund loans or municipal leasing funds for City hangars, and develop revenue-producing facilities at the airport to generate matching funds for future airport development and maintenance grants.
- Adopt new height zoning ordinances and zoning protection for the Oakdale Municipal Airport in accordance with its expanded role described in the Master Plan.

2. INVENTORY

The inventory is prepared to provide a description of the airport location and setting, the climatic and geographic features of the area, and the history of the airport. The on-airport and off-airport land use and facility development is described, including the airfield area, terminal area, and airspace. Pertinent information is presented to identify the type and nature of aviation use and the airport tenants.

Location and Setting

The City of Oakdale is located in the San Joaquin Valley in Stanislaus County in central California, approximately 85 miles east of San Francisco. The nearest larger city is Modesto, the County seat, approximately seven miles to the east. Refer to Exhibit 1, Location Map.

The city of Oakdale encompasses 2,540 acres (four square miles) and has a population of approximately 14,500 persons.

Oakdale is an agricultural market center community. The land within the existing City limits is primarily urban, centered around the downtown business district in the historical center of the town. Adjacent uses surrounding the City include orchards, row crops, dairy farms, and food processing facilities.

Oakdale Municipal Airport is located about two miles east of the Oakdale city limit along Sierra Road. Access to the airport is via Laughlin Road from Sierra Road. Although two miles east of the city limits of Oakdale, the airport site itself is in a separate precinct owned by the City.

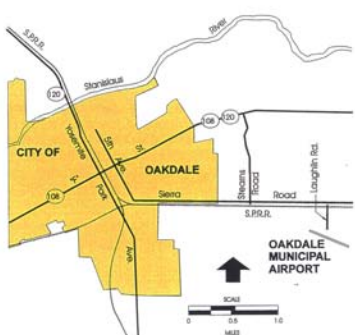
Climate

The climate of Oakdale is typical of the San Joaquin Valley, with mild winters and hot, dry summers. The average temperatures range from 46 degrees to 80 degrees. Rainfall is moderate, averaging about 12 to 14 inches per year, as is typical of the Valley, and occurs primarily during the winter months (November through March). Frequent temperature inversions which occur during the winter cause low stratus fog conditions, resulting in poor ground level visibility.

Based upon National Weather Service Data from Stockton, the prevailing winds in this part of the San Joaquin Valley are from the west or west-northwest during the nine months between March and November. During the winter months of December, January, and February, winds are typically from the southeast.

During the preparation of the previous Master Plan for Oakdale Municipal Airport, a recording device was installed to mechanically read wind speed and direction. The time period covered was January 1977 to January 1978. The findings of the locally monitored data generally corresponded to the data from Stockton, 25 miles away. The local data indicated that the winds have a slightly more northerly component than that recorded at Stockton.

Location



Vicinity

Exhibit 1
Location Map
Oakdale Municipal Airport Master Plan

Geography

The topography of the City of Oakdale and its environs is generally flat, except for gently rolling areas southeast and northwest of the city limits. The most significant natural feature in the area is the Stanislaus River, which flows from east to west along the northern edge of the present city boundaries.

The airport site is located on a relatively flat site which has been partially leveled and filled to accommodate a runway extension of 620 feet to the east, undertaken approximately 15 years ago. The area surrounding the airport is gently rolling terrain with numerous swales and some small hills. An irrigation channel of the Oakdale Irrigation District is located east of the airport site. Elevation of the airstrip is 234 feet MSL. Small hills approximately 30 to 40 feet higher are located to the east. The topography is generally lower to the west and north of the airport.

Soils and Geology

Most of the Oakdale area is underlain by soils of the Hanford, Tujunga, Cometa-Montpellier, Greenfield, and Oakdale soil associations. With the exception of the Cometa-Montpellier association, which typically occurs on alluvial terraces north and northeast of Oakdale, soils within the area are generally well suited for agriculture. These soils also offer few limitations for urban land uses, as soil texture, drainage, erosion potential and slope are factors which introduce similar limitations for either use.

Oakdale is located in the eastern part of the Central Valley, a structural trough between the Sierra Nevada and the Coast Range. Geologic formations of the Central Valley include a bedrock complex of metamorphosed marine sediments, overlain by alluvial (river), lacustrine (lake), and marine sediments to a maximum thickness of over 30,000 feet. More recent geologic formations in the Oakdale area consist of alluvial fan deposits of fine sands and silts laid down by various rivers and flood plains in the area of the Stanislaus River. Near-surface sediments in the Oakdale area are primarily flood plain deposits from the Stanislaus River, although continental sediments formed 25,000 to 13 million years ago are exposed at the surface in some locations.

The Central Valley is considered to be an area of relatively low seismicity in a state characterized by moderate to high seismic activity. Although a few of the fault zones formed within the Coast Range and Sierra Nevada extend beneath the sediments of the Central Valley, no active faults are known to reach the surface within Stanislaus County. The Midland and Tracy-Stockton faults, located about 45 and 10 miles west/northwest of the Oakdale area, respectively, are capable of displacing bedrock formations and some of the overlying sediments. However, according to Oakdale's General Plan, there is no evidence to suggest that either of these faults is likely to cause surface displacement in the Oakdale area.

Ground Access

Regional highway access from the city to the east and north is provided by State Highways 108 and 120, respectively. These two highways converge within the city limits and provide access from the city to the west. Highway 99, a major north-south highway through Central California, is located 15 miles to the west of Oakdale.

Yosemite Avenue (State Route 120 and County Road J-14) and F Street (State Route 108 and State Route 120/108) are the main thoroughfares within the City of Oakdale, dividing the city into four quadrants. The Stanislaus River forms the northern boundary of the city limits and acts as a physi-

cal barrier to the movement of traffic. Railroads within the city also function as physical barriers to the movement of traffic and can disrupt traffic for short periods of time.

Commuter and recreational travel are two types of travel patterns that affect Oakdale's traffic. Commuter travel is increasing due to the influx of new residents that work in Stockton or the Bay Area. Recreational traffic to and from Yosemite National Park and the Sierra Nevada is heavy on State Route 120 and State Route 120/108 during weekends and holidays.

To accommodate existing and future commuter and recreational traffic, two limited access highways are being proposed by Caltrans and Stanislaus Area Association of Governments (SAAG) in the area adjacent to Oakdale. Caltrans is currently preparing preliminary corridor plans for a Highway 120 Bypass around Oakdale. Two alternatives are being considered, both of which would be located north of the airport.

SAAG is planning a limited access Highway 108 Bypass that would begin in Modesto, run south of the city of Oakdale and end to the east of Oakdale at Highway 120. In its General Plan Update, the City defined two options. The first option would extend northerly to existing Highway 120 west of the airport. The second alignment option extends south and east of the airport and intersects existing Highway 120 near Wamble Road. Either option would provide better access to the airport.

It should also be pointed out that Sierra Road is one of the major truck routes in Oakdale. Sierra Road is designated as a collector roadway. The existing traffic volume is approximately 1,300 Average Daily Traffic (ADT), which represents a Level of Service "A" as indicated in the Draft EIR for the Oakdale General Plan.

In addition to road transportation, Oakdale is served by three freight rail companies. These include the Atchinson Topeka and Santa Fe (AT&SF), the Southern Pacific Transportation Company (SPTCo) and the Sierra Railroad. Passenger rail service is not available in Oakdale.

The Sierra Railroad line is located along the south side of Sierra Road. The access road to the airport crosses the rail line at grade, just south of its intersection with Sierra Road. The Sierra Railroad provides freight service between Oakdale and Tuolumne city.

Airport History

Oakdale Airport was established in 1947 as a private aviation facility. At that time, the field consisted of an 1,800-foot primary runway and a 1,650-foot cross-wind runway, both unpaved and unlighted. A main hangar, a Quonset, and some out-buildings were constructed to house a flying school that trained pilots.

In 1960, the Airport was purchased by the City of Oakdale, which owns and operates it to this date. Fifty-seven acres of land and major airport improvements were purchased together with the fueling system and miscellaneous equipment.

The unpaved crosswind runway was abandoned and the primary runway improved in stages. A parallel taxiway was added and lighting was installed by the city. The old single training facility has given way to a modern Fixed Base Operation (FBO), engine overhaul shop, and T-hangars.

The runway and taxiway were extended to the east as a result of the 1978 Master Plan from 2,400 feet to the present 3,020 foot length. The runway is 66 feet wide and has an asphalt surface. The airport currently encompasses 117 acres of land.

The airport is owned and operated by the City of Oakdale and administered by the City Administrator's office. The City Council is responsible for major policy decisions.

Aviation Facilities

Aviation facilities inventoried include the airfield area, the terminal area, and the airspace/ navigational facilities.

Airfield Area

The existing Oakdale Airport is comprised of 117 acres of land with one paved runway. The runway and the runway approaches are described below. See Exhibit 2: Airport Photomap.

Runways

The existing airfield at the airport consists of the following runway:

Table 1
Runway Characteristics
Oakdale Municipal Airport

Runway	Orientation	Dimensions	Effective Gradient	Surface Composition
10-28	E-W	3020' x 66'	0.4%	Asphalt

Source: FAA Airport Master Record #5010 for the Oakdale Municipal Airport, January 1994.

The east-west runway 10-28 is 3,020 feet long. The terminal and hangar areas, are located north of the runway.

Runway 10-28 has medium intensity edge lights. Runway 10 has a Visual Approach Slope Indicator.

The runway, taxiway, and apron pavements are rated "good to excellent". Master plan calculation and analysis resulted in the estimated runway pavement gross weight strengths for aircraft with various landing gear configurations as follows:

Table 2
Pavement Strength
Oakdale Municipal Airport

Runway	Single Wheel	Dual Wheel
10-28	20,000 lbs	N/A

Source: Wadell Engineering Corporation

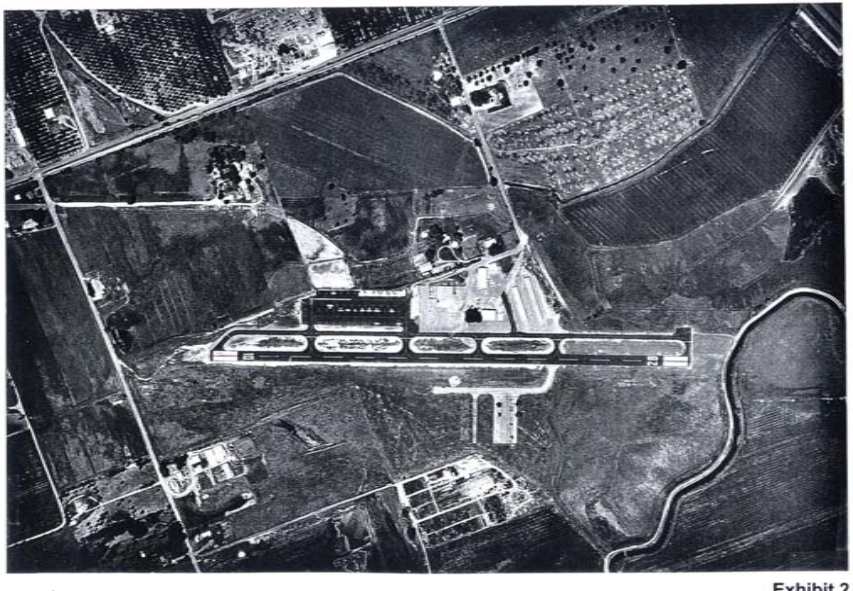


Exhibit 2
Airport Photomap
Oakdale Municipal Airport Master Plan

Runway Approaches and Obstructions

The existing approach slope ratios (horizontal:vertical) for each runway end are as follows:

Table 3
Runway Approach Slopes
Oakdale Municipal Airport

Runway End	Approach Slope
10	50:1
28	50:1

Source: FAA Airport Master Record #5010 for the Oakdale Municipal Airport, January 1994.

Terminal Area

The general aviation area, located north of the runway, consists of two fixed base operator (FBO) buildings and support areas including aprons, hangars, fueling facilities, and related activities. See Exhibit 3: Terminal Area Photomap.

In the terminal area, there are 18 T-hangar spaces and 12 portable hangar spaces. In addition, there is one large private unit hangar (60' by 90'), and two FBO hangars with offices approximately 80' by 100' and 50' by 120'.

Approximately 4.5 acres of aircraft parking apron accommodating 58 tiedown spaces are located in the terminal area.

Airspace/Navigational Facilities

For visual approaches, the airport utilizes a standard left-hand pattern to both runway ends. The patterns altitude is set at 1,234 MSL (1,000 feet AGL).

The airport has one established nonprecision instrument approach procedure. The approach is "VOR Rwy 10", which utilizes the Manteca VOR. The minimums are 700 feet MDA with 1 mile visibility. All instrument approaches to Oakdale Municipal are handled by the FAA Approach Control facility at Stockton.

Off-Airport Land Use

The City of Oakdale occupies a four square mile area on the south side of the Stanislaus River. The urban pattern is compact and contiguous. The urban land uses in the city cover some 1,800 acres of developed land for residential, commercial, industrial, and public sues. Past growth of the city has occurred in an elongated band between the river and the railroad tracks.

The residential uses are located in four quadrants around the center of Oakdale. Large lot and estate residential extends to the east along the north side of Highway 120, and north of the Stanislaus River. Residential uses in the city occupy 712 acres, at an average of 7.8 dwelling units per acre.

TERMINAL AREA FROM THE SOUTH LOOKING ACROSS THE RUNWAY

HANGARS AND TIEDOWNS IN THE TERMINAL AREA

TIEDOWNS IN THE NORTHWEST OF THE TERMINAL AREA

Exhibit 3
Terminal Area Photographs
Oakdale Municipal Airport Master Plan

Table 4
Building Inventory
Oakdale Municipal Airport

Building	Size	Construction	Condition
Nine Unit East T-Hangars (City Owned)	31'x285'	Wood Frame/ Metal Siding	Fair
Seven Unit East T-Hangars (City Owned)	31'x225'	Wood Frame/ Metal Siding	Fair
Central FBO Hangar (City Owned)	80'x100'	Metal Frame and Siding	Good
Central FBO Hangar (Privately Owned)	50'x120'	Metal Frame and Siding	Excellent
Unit Hangar (Privately Owned)	34'x41'	Metal Frame and Siding	Good
Unit Hangar (Privately Owned)	60'x90'	Metal Frame and Siding	Good
Misc. Unit Hangars (Privately Owned)	13 each	Metal	Good
Mobile Home (Privately Owned)	24'x56'	Wood	Excellent
Two Unit Central T-Hangars (City Owned)	31'x65'	Wood Frame/ Metal Siding	Fair
Aircraft Wash Rack	40'x40'	Concrete	Good
City Fuel Farm	Two Tanks	Metal, Underground	Poor

Source: Wadell Engineering Corporation

Commercial uses are located in the central business district and along Yosemite Avenue and F Street, which intersect in the central business district. A majority of the industrial uses are located in the south section of the city, south of the railroad tracks, along Yosemite Avenue. Acreage of commercial and industrial land is relatively high (456 acres), due to the fact that Oakdale has two large industrial uses, Hershey Chocolate and Hunt-Wesson Foods.

Land uses outside the City of Oakdale boundaries consist primarily of agricultural uses and rural residences. In addition to farm residences as part of large agricultural tracts, there are rural ranchettes. Most adjacent lands are rural, consisting of grazing lands and, to a lesser degree, orchards and cultured fields. There are approximately 800 dwellings in the secondary area outside of the city boundaries.

The airport is located approximately two miles east of the current city boundaries of Oakdale. The site itself is owned by the City and constitutes an island of City property surrounded by land under County of Stanislaus jurisdiction. Land uses surrounding the airport are generally agricultural, with some rural residential uses. A few of these residential uses are located along Laughlin Road, the access road to the airport. An auto wrecking/scrap yard facility is located north of the airport along the north side of Sierra Road. The land surrounding the airport is currently zoned for agricultural uses.

The 1993 Oakdale General Plan designates the area north of the airport, north of Sierra Road, as one of three new residential development areas for the city. As well, the Plan proposes a commercial/office/conference area at the airport, between the airport site and Sierra Road, along with a possible municipal golf course located generally west of the airport site, which could connect with the conference center.

3. AVIATION FORECASTS

The aviation forecasts are prepared by first selecting and identifying the airport service area and its associated socioeconomic data, followed by analyzing aviation trends including aircraft activity and based aircraft. The activities commonly forecast for airport planning include passengers, aircraft operations, and based aircraft. In this plan, forecasts are projected through the year 2015.

Airport Service Area

The area served by Oakdale Municipal Airport is designated in this report as the airport service area. Geographical boundaries for airport service areas consist of a city, county, or other governmental subdivision because relevant population and economic data are readily available. Trends in aviation demand correspond with local growth trends in the governmental entity containing the main concentration of population served by an airport. Oakdale Municipal Airport is strategically located to serve general aviation demand in metropolitan Oakdale and the surrounding unincorporated parts of Stanislaus County. This area represents the airport service area for Oakdale Municipal Airport and is supported by information on population and economic data in that area, as well as the information on business and home locations of airport users.

Socioeconomic Data

Oakdale had a population of approximately 2,600 people in 1940. This grew to almost 6,600 people in 1970. Between 1970 and 1992 the average annual rate of growth was 3.1%. The population was approximately 8,500 in 1980 and almost 12,000 in 1990. By 1993, the Oakdale Draft General Plan indicated the population to be 13,586. Refer to Table 5. During the period between 1940 and 1990, Stanislaus County population grew from 74,866 to 376,100.

The 1993 Oakdale General Plan has used the city's annual average growth rate between 1980 and 1992, which was 3.5%, as the basis for projecting the future population of the city. The plan projects a population of 28,777 people by the year 2015. Refer to Table 5.

In terms of economic base, agriculture has been the primary economic activity in Stanislaus County for the past 100 years or more. Agricultural production in the county consists of livestock and poultry production, fruits and nuts, and field and vegetable crops. Manufacturing in the county is predominately in the areas of food processing/production. In Oakdale, Hershey Chocolate and Hunt-Wesson Foods are the two major industrial uses.

In the past, Stanislaus County was a low-cost labor market compared to other counties in the Bay Area and Central Valley. However, many newcomers to the Oakdale area and the County are of a different socioeconomic and cultural profile. A recent study conducted in concert with Pacific Gas and Electric Company titled "The Oakdale Business Climate Assessment and Target Industry Study (December 1991)" noted that newer residents tend to have higher expectations, skills, and educational and income levels than the native population of the Oakdale area.

The 1993 Oakdale General Plan (Draft Report, Volume I, October 1993) is designed to accommodate an ultimate population of 48,000 to 50,000 people. This growth would occur after the year 2015. The ultimate land use plan expands the city from four square miles to 18 square miles.

In addition, there are several proposed "new town" prospects in the vicinity of Oakdale. The new community of Riverbrook is located on the north side of the Stanislaus River across from the city of Riverbank. This 909-acre project will accommodate 1,987 dwelling units, a golf course and fifteen acres of commercial uses. The build-out population would be nearly 5,000 persons.

The proposed Village One community would occupy 1,800 acres (nearly three square miles) adjacent to Modesto. This development would result in an eventual population of 22,000, mostly in single family residences (with limited commercial uses). An industrial business park extends along the eastern edge of this proposed community.

Table 5
Historical and Projected Population Trends
Stanislaus County and City of Oakdale

Year	Stanislaus County	City of Oakdale
1940	74,866	2,592
1950	127,231	4,064
1960	157,294	4,980
1970	194,506	6,594
1980	---	8,474
1990	376,100	11,961
1993	---	13,586
Projected:		
1995	445,700[1/]	--[2/]
2000	502,300	17,176
2005	558,200	20,400
2010	---	24,229
2015	---	28,777

Sources: Historical: U.S. Department of Commerce, Bureau of the Census (1940-1990).
Projections: [1/] California State Department of Finance, 1991.
Projections: [2/] Oakdale City Draft General Plan, October 1993

Aviation Trends

General aviation flying can be divided into four major categories:

- Business: The use of an aircraft for executive or business transportation. This category includes (1) aircraft used by a corporation or other organization and operated by professional pilots to transport its employees/property (not for compensation or hire), and (2) aircraft used by an individual for transportation required by a business in which he is engaged.

- Commercial: The use of an aircraft for commercial purposes (other than the certificated air carriers) in three types of activity: (1) air taxi, involving any use of an aircraft by the holder of an air taxi operating certificate; (2) aerial application, such as the distribution of chemicals (cropdusting); and (3) industrial special, such as pipeline patrol survey, advertising, and photography.

- Instructional: The use of an aircraft for flight training under an instructor's supervision.

- Personal: The use of an aircraft for personal reasons similar to the utilization of an automobile.

At the outset of the forecasting process, it is important to recognize the overall impact of general aviation on the nation's economy and anticipated growth in general aviation through future years. FAA statistics of current activity and forecasts through 2006 identify a decreasing trend in general aviation growth. In 1993 there were 176,006 general aviation aircraft in the United States. Of these, 73.6% are piston powered aircraft, 2.6% rotorcraft, 2.5% turboprops, and 2.2% jets. Of the piston aircraft, 9.3% are twin engine. Based on owner reports, the use is as follows: 55% personal, 20% business, 5.5% executive, 7.2% instruction, 3.2% spraying, 2.1% observation, 0.6% other work, 0.8% commuter air carrier, 3.4% air taxi, 2.6% miscellaneous activities, and 22% inactive. The network of general aviation airports around the United States is the backbone of the nation's air transportation system.

General aviation includes a multitude of diverse and growing uses of aircraft, ranging from flying for sheer enjoyment to transportation of personnel by business firms in privately owned aircraft to highly specialized uses such as cropdusting, patrol, and aerial photography.

Historical and forecast growth of the national general aviation aircraft fleet by type of aircraft, as developed by the FAA, is set forth in Table 6. According to the FAA forecasts, the national general aviation fleet is expected to decrease from 176,000 aircraft in 1994 to 174,600 aircraft by 2006. Of these forecast aircraft, 79.3% are piston powered aircraft, 6.3% are turbine powered aircraft, and 3.6% are categorized as "other," which are not fixed or rotary wing. Of the piston aircraft, 9.1% are twin engine.

Table 6
National Active General Aviation Aircraft
by Type of Aircraft
FY 1990 - FY 2005
(In Thousands)

	1990	1995	2000	2005
Fixed Wing				
Piston				
Single Engine	158.7	128.1	122.4	122.4
Multi-Engine	21.4	16.2	15.6	15.9
Subtotal	180.1	144.3	138.0	138.3
Turbine				
Turboprop	5.2	4.5	5.2	5.7
Turbojet	4.0	4.0	4.7	5.2
Subtotal	9.2	8.5	9.9	10.9
Rotary Wing				
Piston	3.0	1.6	1.5	1.5
Turbine	4.0	3.0	3.5	4.0
Subtotal	7.0	4.6	5.0	5.5
Other	7.1	16.4	17.8	19.3
Total	203.4	173.8	170.7	174.0

Source: FAA Forecasts, Fiscal Years 1995-2006, March 1995

Aircraft Activity

General observation of the activity at Oakdale Municipal indicates that it is not particularly busy, except on summer weekends. However, as with most non-towered airports, aircraft operations have not been counted on any continuing basis.

It is estimated that 60% of current operations are local and 40% itinerant. Of these, approximately 4% of all operations were estimated to be by twin-engine aircraft and 0.5% by business jets. Thus, the vast majority of operations are by single-engine aircraft at Oakdale Municipal Airport.

Based Aircraft

Oakdale Municipal Airport serves Oakdale and adjacent county areas. This is demonstrated by the geographic distribution of the airport's based aircraft owners (determined by a list of their mailing addresses), as illustrated in Table 7. Some 35% of Oakdale aircraft owners (including fixed base operators) had Oakdale vicinity addresses. Approximately 44% were from other Stanislaus county locations. The number of aircraft based at Oakdale Municipal Airport has shown a continual increase over the years.

Table 7
Aircraft Owners by Location
Oakdale Municipal Airport

Owner City	Percent
Oakdale Vicinity	35
Other Stanislaus County	44
San Joaquin County	8
Tuolome County	7
Alameda County	6

Source: Wadell Engineering Corporation Analysis of Airport Manager Records

An airport plan is primarily developed from aviation demand forecasts. The California Department of Transportation (CalTrans) and the FAA through the National Plan of Integrated Airports System (NPIAS) provide information. To receive federal aid, airports must be in the NPIAS. Forecasts of based aircraft and operations from the NPIAS show that by the year 1999 there will be 66 aircraft based at Oakdale and 47,000 total operations. The state forecasts, published by Caltrans, show 75 based aircraft and 48,641 total operations in the year 2005.

Regional and system level forecasts are not suitable for site specific planning purposes due to lack of detail; therefore, individual airport forecasts are performed during the master planning process. In forecasting, it is the number of based aircraft that "drives" a demand model. Factors which influence an aircraft owner's decision to base his aircraft are the location of the airport, the accessibility of the site, and the availability of facilities for the user.

Recognizing the character and nature of aviation facilities within Stanislaus County, the following developments should result with time:

- The growth of population in Stanislaus County in general and Oakdale in particular will increase aviation demand;

- The need for general aviation training, aircraft basing, and the impact of increased traffic at the Modesto Airport will result in increasing demand for airport development in the Oakdale area.

To prepare a based aircraft forecast, adjustments need to be made to the Caltrans ASP forecasts. To project future based aircraft at Oakdale, the current County population and the current Oakdale based aircraft value was used. Next, a weighted based aircraft growth rate was calculated, with the County growth having a weight of 79%, and the City of Oakdale rate having a weight of 21%. This is in proportion to the actual aircraft basing patterns in the City and County. A two percent growth rate limitation was set to reflect the decreasing trend in the FAA national forecasts.

Forecasting general aviation activity in the study area cannot be separated from other general aviation issues in the area. Activity at any airport is dependent upon development at other airports as well as capacity constraints and limitations. Oakdale Municipal Airport is oriented toward general aviation operations including business, pleasure, and industry travel.

At present, there is no scheduled air cargo service in operation at Oakdale, although bank courier cargo, personal, and business/industry cargo is moved in general aviation aircraft. Rail and truck transportation remain the primary means of transporting commodities. Air freight movement exists at Modesto, but remains at a low level. There are no plans for cargo shipments from Oakdale Airport at this time. The attractiveness for cargo service is limited due to lack of backhaul loads on the return trip and the existing runway length, which limits the payload of cargo and business aircraft.

Aviation Forecasts

For purposes of this study, forecasts were prepared for based aircraft and annual operations from 1995 through the year 2015. The forecast, as presented in Table 8 and Exhibit 4, provides detailed information concerning the determination of mix for runway capacity analyses, the types of based aircraft for future apron and hangar parking requirements, the number of instrument operations for determination of instrument approach capabilities and needs, and the aircraft operations by type for use in the airport noise analyses.

Single engine, multiple engine, and helicopter aircraft are identified in Table 8. It is expected that some business jet and turboprop aircraft would be based at Oakdale due to increasing business and industrial development.

The forecast of aircraft operations is by type of operation, type of aircraft, and type of user. The local aircraft movements include touch-and-go training activity as well as flights in the immediate airport environs. The remaining aircraft movements are classified as itinerant, which includes flights that have origins and/or destinations away from the airport.

The instrument operations noted in Table 8 include instrument approaches (when aircraft arrive at the airport under instrument conditions using navigational aids) and instrument departures, which are the primary portion of the instrument operations. Typically there are more instrument departures than instrument approaches at general aviation airports since the instrument approach is a

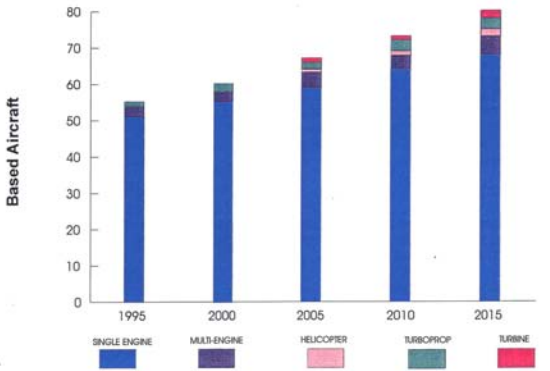
more precise operation and usually occurs when arriving at a destination where it is necessary to let down to the airfield through cloud conditions or fog. Instrument departures most often involve a climb-out from the airport during instrument conditions when visual flight rule conditions exist on top of the clouds. The airport experiences a significant level of instrument training flights, including many aircraft from other airports.

Table 8
Aircraft and Operations Forecast
Oakdale Municipal Airport
1995-2015

	1995	2000	2005	2010	2015
Based Aircraft:					
Single Engine	51	55	59	64	68
Multi Engine	3	3	4	4	5
Helicopter	0	0	1	1	2
Turboprop	1	2	2	3	3
Turbine	0	0	1	1	2
Total	55	60	67	73	80
Annual Aircraft Operations:					
By Type of Operation					
Local	22,910	24,890	27,290	29,710	32,110
Itinerant	13,750	14,940	16,370	17,820	19,270
Total	36,660	39,830	43,660	47,530	51,380
By Type of Aircraft					
Single-Engine Prop.	34,430	37,130	39,830	43,200	45,900
Multi-Engine Prop.	1,350	1,350	1,800	1,800	2,250
Helicopter	10	10	260	260	510
Turboprop	660	1,100	1,140	1,600	1,660
Turbine	210	240	630	670	1,060
Total	36,660	39,830	43,660	47,530	51,380
By Type of User					
Military	0	0	0	0	0
General Aviation	36,660	39,830	43,660	47,530	51,380
Total	36,660	39,830	43,660	47,530	51,380
Aircraft Operations Distribution					
Peak Month	5,500	5,970	6,550	7,130	7,710
Peak Week	1,380	1,490	1,640	1,780	1,930
Average Day of Peak Month	180	200	220	240	260
Peak Hour of Average Day of Peak Month	27	30	33	36	39
Instrument Operations	1,380	1,490	1,640	1,780	1,930
Approaches	350	370	410	450	480

Source: Wadell Engineering Corporation

As of 6-14-94



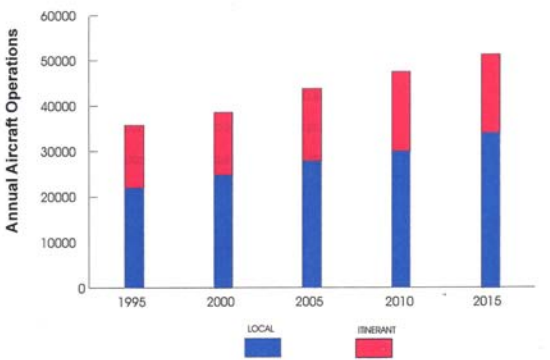


Exhibit 4
Aviation Forecasts
Oakdale Municipal Airport Master Plan

4. AVIATION REQUIREMENTS

Demand/capacity analysis and facility requirements are based on guidelines established in FAA Advisory Circulars, FAA Regulations, and good planning and engineering judgment. Facility requirements are matched with the forecast of aviation demand to provide for the safe, efficient, and convenient utilization of the airport without unreasonable delays. It should be recognized that on the basis of demand, this chapter merely identifies items and quantities for input to the Airport Plans section of the report (Chapter 5). Actual recommended development is identified in the Implementation Plans section (Chapter 6), where all of the physical and financial aspects of the proposed development are brought together.

Aircraft/Airport Classifications

Airports are planned and developed to serve certain categories of existing and future user aircraft. In order to select appropriate dimensional standards, it is necessary to identify the various categories and design groups of aircraft.

Aircraft Approach Category

An aircraft approach category is a grouping of aircraft based on an approach speed of 1.3 V_{SO}. V_{SO} is the aircraft stall speed at the maximum certificated landing weight. V_{SO} and the maximum certificated landing weight are established for the aircraft by the certificating authority of the country of registry. The aircraft approach categories are presented in Table 9.

Table 9
Aircraft Approach Category

Category	Approach Speed
A	Less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

Source: FAA Advisory Circular 150/5300-13.

Airplane Design Groups

The airplane design groups table categorizes airplanes by wingspan and is presented below.

Table 10
Airplane Design Groups

Group	Wingspan
I	Up to but not including 49 feet (15 m)
II	49 feet (15 m) up to but not including 79 feet (24 m)
III	79 feet (24 m) up to but not including 118 feet (36 m)
IV	118 feet (36 m) up to but not including 171 feet (52 m)
V	171 feet (52 m) up to but not including 214 feet (65 m)
VI	214 feet (65 m) up to but not including 262 feet (80 m)

Source: FAA Advisory Circular 150/5300-13.

Airport Types

Airport types describe the operational and physical characteristics of the airplanes intended to operate at an airport. The airport reference code (ARC) is a system developed by the FAA which utilizes aircraft approach category and airplane design group components to assist in the design of critical airport elements meeting the requirements of the airplanes anticipated to use the aviation facilities.

Transport airports are designed, constructed, and maintained to serve airplanes in aircraft approach categories C and D, while utility airports serve the smaller airplanes in aircraft approach categories A and B. The latter airplanes are commonly used for personal and business flying, and for commuter and air taxi operations. The airport types are presented in Table 11.

Table 11
Airport Types

Type	Description
Basic Utility--Stage I	This type of airport serves about 75 percent of the single-engine and small twin-engine airplanes used for personal and business purposes. Precision approach operations are not usually anticipated. This airport is designed for small airplanes in airport reference code B-I.
Basic Utility--Stage II	This type of airport serves all the airplanes of Stage I, plus some small business and air taxi-type twin-engine airplanes. Precision approach operations are not usually anticipated. This airport is also designed for small airplanes in airport reference code B-I.
General Utility--Stage I	This type of airport serves all small airplanes. Precision approach operations are not usually anticipated. This airport is also designed for airplanes in airport reference code B-II.
General Utility--Stage II	This type of airport serves large airplanes in aircraft approach category A and B and usually has the capability for precision approach operations. This airport is normally designed for airplanes in airport reference code B-III.
Transport	This type of airport serves all large airplanes in aircraft approach categories C and D.

Source: FAA Advisory Circular 150/5300-13.

Airport Service Role

Oakdale Municipal Airport is classified in the NPIAS as a basic utility airport. It currently serves as a basic utility stage I airport predominantly serving aircraft with approach speeds up to but not including 121 knots (Category B). On occasion the airport receives transient business jet aircraft. The airport should be developed as a general utility stage II airport handling B-II aircraft.

Airfield Capacity

Airfield facilities were evaluated for their ability to satisfy forecast aviation demand at the airport. Hourly runway capacities and annual service volume were estimated. Hourly runway capacity is defined as the maximum number of aircraft operations that can take place in one hour for given conditions. Annual service volume is a measure of annual aircraft operations that can be used as a reference in preliminary airfield planning.

The aviation forecasts along with the 1995 operations levels were evaluated. The airfield layout and operational use was determined from the Airport Layout Drawing and observations of airfield operations.

Runway Use

Runway use encompasses the number, location, and orientation of active runways, as well as the directions and types of operations using each runway. Runway use depends primarily on wind direction and wind speed, but also depends on other factors such as air traffic control rules and noise abatement procedures, runway instrumentation, taxiing distance, and runway length. The annual use percentages were calculated based upon conversations with Airport management, available wind analysis, and observations of airfield use. It is estimated that Runway 10 is used 10% of the time, and Runway 28 is used 90% of the time.

Airspace and Air Traffic Control

Oakdale Municipal Airport has no on-airport navaids, but uses the Manteca VOR. Current minima for straight-in landing are one mile visibility and 700 feet MSL decision height. Stockton approach control has been delegated responsibility for control of instrument flight rules (IFR) aircraft within this area. The overall airspace of Oakdale Municipal Airport and its neighboring airports is generally unrestricted.

It is assumed that current air traffic control procedures will continue throughout the planning period to 2015. Ongoing FAA research may lead to new standards in the future. The benefits from this research will be realized primarily under IFR conditions, which is an important factor at Oakdale Municipal Airport. The Oakdale Municipal Airport should preserve for a precision approach system with sites for a glide slope and localizer antenna for instrument descent enhancements. A global positioning system could also be installed. An FAA funded air traffic control tower is not expected to be commissioned during the planning period, since entry level traffic demand criteria must be over 200,000 annual operations.

Ceiling and Visibility Conditions

Ceiling and visibility have an important impact on airfield operations and runway capacity because spacing between aircraft is often less with high ceilings and good visibility than when conditions are less favorable. The two types of flight rules for specific weather conditions are visual flight rules (VFR) and instrument flight rules (IFR). The definitions of these conditions are:

VFR: Ceiling is at least 1,000 feet and visibility is at least 3 miles
IFR: Ceiling is below 1,000 feet and/or visibility is below 3 miles

There is no weather data to establish the percentage of VFR versus IFR conditions. It is assumed that VFR conditions occur approximately 90% of the time and IFR conditions occur approximately 10% of the time. It is seldom that IFR conditions continue throughout a full day. Low ceilings and fog usually dissipate by mid-day.

Aircraft Mix

Aircraft mix is composed of four aircraft classifications: A, B, C, and D. Class A includes small single-engine aircraft (weighing 12,500 pounds or less); Class B includes small twin-engine aircraft (weighing 12,500 pounds or less); Class C includes large aircraft weighing more than 12,500 pounds and up to 300,000 pounds; and Class D includes heavy aircraft weighing more than 300,000 pounds. No Class D and few class C aircraft utilize Oakdale Municipal Airport.

The following aircraft mix at the airport was derived from the aviation demand forecasts presented in Table 8. It was assumed that helicopters are negligible. All turboprop and turbine aircraft and multi-engine piston aircraft are assumed to be Class B. For this study, it is assumed that 50% of the Class A aircraft do not operate in IFR weather conditions and that all Class B aircraft will operate during IFR conditions.

Table 12
Aircraft Mix
Oakdale Municipal Airport

Aircraft Class (VFR Conditions)	1995	2005	2015
A	94	92	90
B	6	8	10
Aircraft Class (IFR Conditions)			
A	89	85	82
B	11	15	18

Source: Wadell Engineering Corporation

Hourly Runway Capacity

Hourly runway capacity is the maximum number of aircraft operations that can take place in one hour for given conditions. Factors that affect hourly runway capacity include:

- Runway use
- Airspace and air traffic control
- Ceiling and visibility conditions
- Aircraft mix

VFR peak hourly capacity at Oakdale Municipal Airport are dependent on the runway-use configuration actually utilized. IFR operations at Oakdale Municipal Airport only occur under a single runway-use configuration. Estimated hourly runway capacities, together with peak hour demand for the planning period, are as follows:

Table 13
Hourly Runway Capacity
Oakdale Municipal Airport

	Planning Period		
	1995	2005	2015
VFR peak hourly demand	27	33	39
VFR peak hourly capacity	100	100	100
IFR peak hourly demand	3	4	5
IFR peak hourly capacity	10	15	15

Source: Wadell Engineering Corporation

Under both VFR and IFR conditions, the hourly runway capacities are above peak hour demand through the 20-year planning period. It is assumed that IFR conditions occur approximately 10% of the year and do not continue over a long period of time.

Annual Service Volume

Annual service volume is based on hourly capacities for the airfield operating conditions that occur throughout the year and on monthly, daily, and hourly variations in aircraft operations.

The estimated annual service volume and the forecast annual demand levels are as follows:

Table 14
Annual Service Volume
Oakdale Municipal Airport

Year	Annual Service Volume	Annual Demand
1995	215,000	36,660
2005	215,000	43,660
2015	215,000	51,380

Source: Wadell Engineering Corporation

On the basis of the analyses of the existing airfield, it is concluded that Oakdale Municipal Airport capacity exceeds aviation demand throughout the planning period.

Facility Requirements

An airport is composed of major elements which contribute to its overall size and shape. The principal components include:

- AIRFIELD
  - Runways
  - Taxiways
  - Visual Aids/Lighting
- TERMINAL AREA
  - Airplane Parking and Tiedown
  - Buildings and Hangars
  - Roads and Auto Parking
  - Support Facilities
- AIRSPACE/NAVAIDS
- LAND AREA REQUIREMENTS

This section discusses the facilities required to accommodate the forecast aviation demand. Each of the major facility requirement categories noted above is described separately. The facility requirements are summarized in tabular form at the end of this chapter.

Airfield

The airfield requirements analysis is prepared to determine future needs for the runway, taxiway, and visual aids/lighting systems. These requirements relate the extent and type of development necessary to accommodate the forecast demand and the capacity required of the airfield system.

Runways

Analysis of the runway system involves a determination as to necessary runway length, strength, orientation, and markings.

Runway Length

Runway length is determined analytically by evaluating the elevation of the airport above mean sea level and the design temperature, which is the mean of the maximum temperature during the hottest month of the year. An assumed design elevation of 234' and a critical temperature of 97 degrees F was used to prepare the runway length requirements table.

The Transport or business jet runway length requirements are based on aircraft size and useful load carried. The 75 percent level of business jet fleet includes all business jets weighing up to 30,000 pounds, typically the smaller business jets. The 100 percent fleet includes the largest planes up to 69,000 pounds, such as the Gulfstream III.

Table 15
Runway Length and Strength Requirements
Oakdale Municipal Airport

Airport Classification	Runway Length	Runway Strength*
Existing Airport		
Runway 10-28	3,020 ft.	20,000 # S
Basic Utility Stage I	2,700 ft.	8,000 # S
Basic Utility Stage II	3,200 ft.	8,000 # S
General Utility Stage I	3,800 ft.	12,500 # S
General Utility Stage II	4,400 ft.	30,000 # S
Transport**		
75%/60%	5,500 ft.	30,000 # S
75%/90%	7,300 ft.	30,000 # S
100%/60%	5,800 ft.	60,000 # D
100%/90%	9,400 ft.	60,000 # D

* "S" is pounds of single wheel gear configuration load; "D" is pounds of dual wheel load.
** First percent is aircraft size within business jet fleet; second percent is amount of useful load carried.

Source: Wadell Engineering Corporation

Discussions with a number of FBOs and airport management indicate that the majority of activity involves single-engine aircraft and light twin-engine aircraft; but heavy twin-engine, turboprop, and business jet aircraft also utilize the airport facilities.

The existing 3,020 foot runway can handle only small general aviation aircraft. The existing runway can not handle even the lightest business jets with standard runway lengths. A runway extension to 4,400 feet total length will be needed to bring the airport to a general utility stage II standard. load.

Runway Strength

The runway strength is determined by the airport runway category and type of aircraft anticipated to operate at the airport. The runway pavement strengths of each runway adequately meets the standards required for the type of operation expected at the airport as shown in Table 15.

Runway Orientation

The configuration of the airport is determined by the number and orientation of the runways. The primary factors related to the number of runways required are airfield capacity and demand.

One of the primary factors influencing runway orientation is wind. FAA criteria for a utility airport specify that a crosswind runway is required if the primary runway is oriented so that the crosswind on it exceeds 12 miles per hour (10.5 knots) more than 5 percent of the time (thus providing less than 95 percent wind coverage). Where a single runway orientation does not provide this usability factor of at least 95 percent, the airport system should include a crosswind runway. For a business jet or transport type runway, the criteria is 15 miles per hour (13 knots).

The airport wind rose indicates that Runway 10-28 has 99% wind coverage on a 15 mph crosswind basis and 97.5% coverage on a 10 mph crosswind.

Runway/Taxiway Markings

For paved runways, white runway numbers and centerline stripes are recommended. Non-precision and precision runways have additional threshold and edge markings. Yellow taxiway markings along the centerline and a transverse holding line a specified distance from the runway centerline are recommended. The proper distances are found in the Airport Plans chapter.

Taxiways

The addition of taxiways increases the airport operational efficiency and the runway capacity potential. Exit taxiways should be located at frequent intervals along a runway to serve each type of aircraft operating under variable landing conditions. They should provide for a free flow of aircraft to a point where the aircraft is clear of the runway, thereby ensuring continuous flow and maximum capacity. The Range in Acceptable Exit Locations (Table 16) shows the range of acceptable exit locations by type of aircraft for various types of exits. Parallel taxiways are recommended to enhance airport operational flexibility efficiency. Based on the taxiway analysis, adequate exit taxiways are available on runway 10-28.

Table 16
Range in Acceptable Exit Locations
Distance from Threshold
Oakdale Municipal Airport

Exit Type	Existing Exit Locations		Range Usable by General Aviation Aircraft
	Runway 28	Runway 10	
Right Angle (90°)	850', 1325', 1800', 2400', 3000'	625', 1225', 1625', 2175',3000	1250' - 4400'
Angle (45°)	---	---	1050' - 3900'
High Speed (30°)	---	---	850' - 2400'

Source: Wadell Engineering Corporation

Visual Aids/Lighting

The following visual aids and lighting are considered to be the minimum necessary at a well-planned, public, general aviation airport:

Basic runway markings
Segmented circle
Lighted wind cone
Rotating beacon
Medium Intensity Runway Lights (MIRL)
Precision Approach Path Indicator System (PAPI)

In addition to the above visual aids and lighting, airports with precision or non-precision approaches and larger aircraft have some of the following:

Runway End Identifier Lights (REIL)
High Intensity Runway Lights (HIRL)
Runway distance marker signs
Approach light systems with sequence flashing lights
Non-precision or precision runway markings

The Oakdale Municipal Airport has a non-precision runway with direct burial medium intensity edge lighting. Additions for Runway 10-28 include extension and placement in conduit for the runway edge lighting system, runway distance marker signs, and REIL for Runway 10, with baffles to prevent offensive light intrusion of neighboring properties. Additions to the lighting systems will be incorporated in the capital improvement program.

Terminal Area

Terminal area requirements include airplane parking and tiedown aprons, buildings and hangars, roads and auto parking. The Facility Requirements table at the end of this chapter presents the summary of necessary facilities.

Airplane Parking and Tiedown Aprons

The currently available apron tiedown positions are adequate to meet demand through the forecast period. However, continued review of these requirements is necessary to monitor any shifts or changes in demand characteristics. The west apron has "tail-to-tail" parking of aircraft. The central apron area configuration does not provide good parking and spacing for business jets and large multi-engine aircraft. These spaces should be "power-in and power-out" parking.

The facility requirements for airplane parking and tiedown aprons were determined by relating existing and planned apron tiedown positions with projected demand by aircraft type. The General Aviation Facilities Requirements Summary table (Table 19) identifies the demand for aircraft parking by type. Transient parking space requirements are based on projections of existing demand, recognizing an increase in business and visitor activity. Airplane parking and tiedown requirements have been estimated based on characteristics of local based tiedown demand. A waiting list for T-hangar parking exists at this airport. Some aircraft are currently parked on aprons, since hangars are not available for all users. Hence, future based aircraft tiedown space requirements reflect the assumption of hangar demand and the ability to satisfy hangar demands. If adequate hangar facilities are not available, the requirements for tiedown positions are expected to be larger than projected.

Table 17
Available Aircraft Parking Facilities
Oakdale Municipal Airport

Facility	Available Spaces 1994
Tiedowns	
Transient	6
Based Tiedowns	46
	52
Hangars	
Unit Hangars	3
T-Hangars	17
Portable Hangars	15
	35
Total Spaces	87

Source: Wadell Engineering Corporation

Buildings and Hangars

The number of hangars depends upon local demand and climate. Presently, the number of hangar spaces available at the airport total 35 (see Table 17). Conversations with local airport representatives and responses from airport users indicate more hangar facilities are needed. The airport manager maintains a hangar waiting list. Currently 16 names are on the list. Hangar demand is estimated at 64 in 2015.

Fixed based operator lease areas, tiedowns, and hangars are revenue producing facilities. Their timely development is essential for growth of the airport and production of revenues to be used for matching funds. The positive revenue-generating benefits of these facilities will be derived if the facilities are built when sufficient demand exists, thereby assuring the success of the building development program.

Airport buildings should be constructed to fulfill specific needs. These needs include fixed based operator buildings providing repair and maintenance, air charter, shops, salesroom and administrative buildings accommodating the public including pilots, passengers, and visitors. The number of pilots and passengers in the terminal area is presented in Table 18. The activity is not large enough to require a terminal building. Pilots and passengers can use FBO lobbies and facilities.

Table 18
General Aviation Terminal Area Operational Factors
Oakdale Municipal Airport

	1995	2000	2005	2010	2015
Busy Hour Operations					
Local	17	19	21	23	24
Itinerant	10	11	12	14	15
Total	27	30	33	36	39
Busy Hour Pilots & Passengers					
Local	21	23	26	28	30
Itinerant	25	28	31	34	37
Total	46	52	57	62	67
Pilots and Passengers Within the Terminal Area	31	34	37	41	44

Source: Wadell Engineering Corporation.

Roads and Auto Parking

Access to the airport is important to meet demand levels. Automobile access and parking facilities required to serve projected demand have been based on busy hour pilot and passenger forecasts within the terminal area.

Airport access is provided by Laughlin Road, a roadway connected to Sierra Road. These roadways have sufficient capacity to accommodate airport generated vehicular traffic demands throughout the forecast period.

Presently there are 25 spaces available in the parking lots adjacent to the FBO buildings. Based on the forecasts, auto parking for the year 2015 is estimated to be 40 spaces (see Table 19).

Support Facilities

Support facilities for the airport include communications, fuel storage and distribution, electric power, water supplies, waste water disposal, and storm water collection and disposal. Availability of these facilities is essential to the operation of the airport. The extent and condition of these facilities are described in Chapter Five and in the Appendix.

Land Area Requirements

The initial step in any airport development is the determination of sufficient land to ensure that (1) the airport can accommodate the long term air traffic requirements, and (2) the land area contains airport operational areas under appropriate control to ensure compatibility of land use around the airport. The amount of land needed can vary considerably in size depending on landing area (e.g., length, number, and layout of runways and taxiways), approach areas (e.g., runway protection zones), and building area (e.g., T-hangars, aircraft tiedowns, buildings, auto parking). Specific land area requirements are subject to siting and layout and, therefore, are discussed in Chapter Five, Airport Plans.

The foregoing comments about facilities required during the planning period are direct input to the Airport Plans chapter and are used in developing physical layouts. Once the layouts are prepared, quantities and cost estimates for development are determined and presented in Chapter Six, Implementation Plans.

Airspace/Navaids

Oakdale Municipal Airport is served by Victor airways that radiate from the Manteca and Rancho Murieta VORs, including V23, V109, and V113 (see Exhibit 5). These airways serve lower altitude enroute traffic. In addition, jet routes J65 and J189, which serve high altitude air traffic, pass adjacent to the airport.

There are no areas of restricted airspace in the Oakdale area.

Stockton approach control has responsibility for control of instrument flight rules (IFR) aircraft in the area. Generally, the overall airspace in the immediate Oakdale area is unrestricted.

As discussed previously, Oakdale currently has one published instrument approach which uses uses the Manteca VOR.

The addition of a localizer/DME approach system at the airport would enhance control and operation of aircraft, improve safety during instrument operations, and relieve Stockton approach controller workload. It would be useful as an area training facility, relieving Modesto and Stockton airports.

An analysis of existing navaids serving Oakdale Municipal Airport was undertaken to assess the capability of these facilities to adequately serve future air traffic operations. Currently, the Airport has good navigational facilities. Runway 10 has a non-precision approach area using the Manteca VOR, but lacks a glide slope and localizer facility for precision approaches. An automated surface observation system (ASOS) is necessary for automatic weather reports since the airport does not have a tower or flight service station. Future lighting additions for Runway 10-28 include extensions to the medium intensity runway lights (MIRL), precision approach path indicators (PAPI), and runway end identifier lights (REIL).

Table 19
General Aviation Facility Requirements Summary
Oakdale Municipal Airport

	1995	2000	2005	2010	2015
Demand					
Based Aircraft	55	60	67	73	80
Aircraft Operations	36,660	39,830	43,660	47,480	51,380
Airfield Facilities					
Runways - Number	1	1	1	1	1
Longest Length (feet)	3,020	4,400	4,400	4,400	4,400
Width (feet)	66	75	75	75	75
Strength (pounds - single)	20,000	20,000	20,000	20,000	20,000
Terminal Facilities					
Airport Business Tenants	2	2	2	2	2
Acres	3.0	3.0	3.0	3.0	3.0
Auto Parking - Spaces	28	30	34	37	40
Acres	0.2	0.2	0.3	0.3	0.3
Hangars - Spaces	35	48	54	58	64
Acres	3.5	4.8	5.4	5.8	6.4
Open Tiedown Spaces					
Based	20	12	13	15	16
Transient	7	7	8	9	10
Open Tiedown Acres					
Based	1	1	1	1	1
Transient	1	1	1	1	1
Total Terminal Area Acres	9.6	10.0	10.7	11.1	11.7
Access					
Access Road Lanes	2	2	2	2	2
Daily Vehicle Trips	165	180	201	219	240
Peak Hour Trips	18	20	22	24	26

Note: Acreage requirements will vary depending on specific layout and geometrics.

Source: Wadell Engineering Corporation

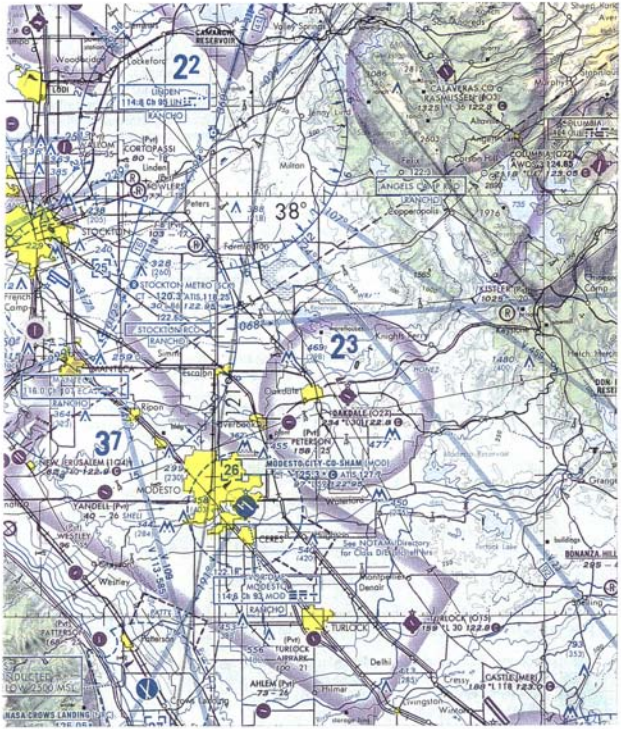


Exhibit 5
Area Airspace
Oakdale Municipal Airport Master Plan

5. AIRPORT PLANS

The Airport Plans represent the end-result of considering alternative configurations of facilities, particularly the establishment of navaids, the location and alignment of T-hangars, the aircraft parking aprons, and the construction of the runway and taxiway system. Incorporated in the Airport Plans are the recommended development items for the three major airport components: the airfield, the airport terminal area, and the access and parking system. Chapter 6, Implementation Plans, discusses the stage development program for these airport improvements, as well as their cost and the economic/financial impacts of undertaking their development.

The specific objectives of the Airport Plans are to provide:

- A safe airfield system with adequate runway length, strength, and clearances for small business jets and general utility stage II aircraft use.
- Terminal facilities for general aviation aircraft, pilots, and passengers with adequate and convenient aircraft basing area, buildings, auto parking, and access.
- A flexible development plan with space and use relationships that will enhance service and provide user and community benefits.
- An economical plan that will provide suitable facilities and generate revenues necessary for proper operation, management and development of the airport.

The Airport Plans for the Oakdale Municipal Airport have been prepared (1) in a simplified graphic format (as presented in this chapter), and (2) in a more detailed technical graphic format (as presented in the Appendix). The corresponding graphics are as follows:

SIMPLIFIED FORMAT	TECHNICAL FORMAT
Airfield Area Plan	Airport Layout Drawing
Airspace Protection Plan	Airport Airspace Drawing Runway Protection Zone Drawing
Terminal Area Plan	Terminal Area Drawing

The technical graphic format has been prepared to meet FAA requirements for processing and approving final master plan drawings.

The appendix includes narrative and exhibits for the following special analyses:

Pavement Plan
Utilities Plan
Airport Property Map

Airfield Area Plan

The Airfield Area Plan depicts the airfield system in the simplified format (see Exhibit 6). It includes the runways, taxiways, lighting, on-airport navaids, and the runway protection zones. The detailed technical format is the Airport Layout Drawing, located in the Appendix.

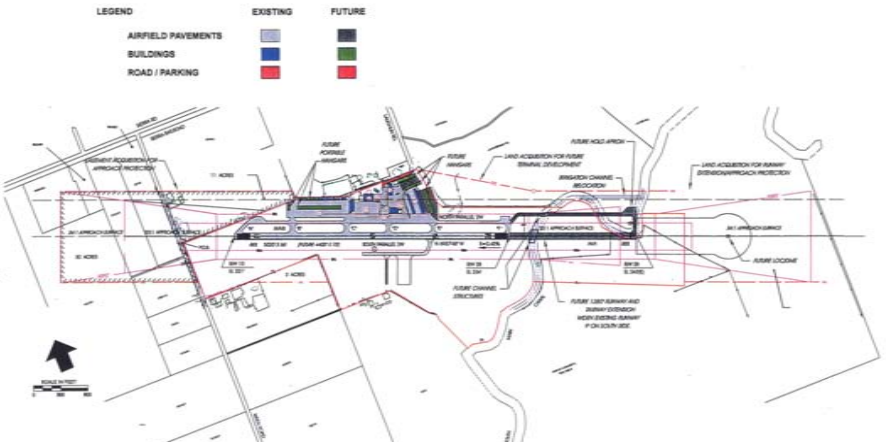


Exhibit 6
Airfield Area Plan
Oakdale Municipal Airport Master Plan

The existing runway 10-28, is 3,020 feet long and 66 feet wide. The width is six feet wider than a basic utility stage II runway, and nine feet narrower than a general utility runway.

The runway is adequate for basic utility use, but does not have sufficient length for small business jets when carrying any significant useful loads.

Runway 10-28 cannot be extended to the west due to terrain, residential land uses, and property constraints. It can be extended to the east through pasture lands. An extension of 1,380 feet will enhance noise abatement and help to satisfy take off length requirements of smaller turbine aircraft and all other general utility aircraft. A runway width of 75 feet is necessary for future standards. The runway should be widened nine feet on the south side to achieve greater separation from the parallel taxiway.

The existing 25-foot wide parallel taxiway serving Runway 10-28 is adequate in width for current use, but should be widened to 35 feet for future general utility use. The existing taxiway is 150 feet from the runway centerline, substandard for current and future conditions. Any future widening should be on the north side to achieve greater runway to taxiway centerline separation. Upon extension of runway 10-28, the parallel taxiway should be extended 35 feet wide with a centerline separation of 240 feet.

Holding aprons should be constructed at both ends of the runway to provide an area clear of taxiway traffic for aircraft to park while the "before-takeoff-check" is performed and IFR departure clearance is obtained. The construction of holding aprons will minimize delays to departing aircraft by providing bypass capability.

The airfield lighting at Oakdale consists of direct burial medium intensity runway edge lighting, taxiway edge lighting, apron flood lighting, visual approach slope indicator on Runway 10 (VASI), and a rotating beacon. The runway 10-28 edge lighting system should be replaced and put in underground conduit when the runway is widened and extended to the east. Apron flood lighting is installed on the centrally located hangar. There is also floodlighting in the apron area. Additional floodlighting will be necessary.

The plan calls for a new PAPI located at the east end of runway 10-28. Runway end identifier lights should be installed with the runway extension project. The addition of distance remaining signs will enhance aircraft operation safety.

Table 20 indicates the runway separation standards for aircraft in approach categories A and B. Table 21 and Table 22 indicate design standards for runways serving aircraft in approach categories A and B for precision and non-precision visual runways, respectively. As discussed previously, existing runway 10-28 is a non-precision category A-I runway. Runway 10-28, when extended in the future, will be a non-precision category B-II runway.

Table 20
Runway Separation Standards for Aircraft Approach Categories A & B

ITEM	AIRPLANE DESIGN GROUP				
	I*	I	II	III	IV
Nonprecision Instrument and Visual Runway Centerline to:					
Parallel Runway Centerline	Varies from 700' VFR up to 4300'+ IFR				
Hold Line**	**125'**	200'	**200'**	200'	250'
Taxiway/Taxilane Centerline**	**150'**	225'	**240'**	300'	400'
Aircraft Parking Area	**125'**	200'	**250'**	400'	500'
Precision Instrument Runway Centerline to:					
Parallel Runway Centerline	Varies from 1000' up to 4300'+				
Hold Line**	175'	250'	250'	250'	250'
Taxiway/Taxilane Centerline**	200'	250'	300'	350'	400'
Aircraft Parking Area	400'	400'	400'	400'	500'

* Facilities for only small airplanes.

** No part of an aircraft (tail tip, wing tip) at a holding location or on a taxiway centerline can be within the runway safety area or penetrate the obstacle free zone (OFZ). An increase to these separation distances may be needed at higher elevations.

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 21
Precision Instrument Runway Design Standards for Aircraft Approach Categories A & B

ITEM	AIRPLANE DESIGN GROUP				
	I*	I	II	III	IV
Runway Length	(Varies--See Aircraft Flight Manuals)				
Runway Width	75'	100'	100'	100'	150'
Runway Shoulder Width	10'	10'	10'	20'	25'
Runway Blast Pad Width	95'	120'	120'	140'	200'
Runway Blast Pad Length	60'	100'	150'	200'	200'
Runway Safety Area Width	300'	300'	300'	400'	500'
Runway Safety Area Length Beyond RW End**	600'	600'	600'	800'	1,000'
Runway Object Free Area Width	800'	800'	800'	800'	800'
Runway Object Free Area Length Beyond RW End**	1,000'	1,000'	1,000'	1,000'	1,000'
Runway Obstacle Free Zone Width and Length	(length = runway length + 400'; width varies from 120' to 400')				

* These dimensional standards pertain to facilities for only small airplanes.

** The runway safety area and runway object free area lengths begin at each runway end. With the declared distance concept, these lengths begin at the stop end of each ASDA and both ends of each LDA, whichever is greater.

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 22
Nonprecision Instrument and Visual Runway Design Standards for Aircraft Approach Categories A & B

ITEM	AIRPLANE DESIGN GROUP				
	I*	I	II	III	IV
Runway Length	(Varies--See Aircraft Flight Manuals)				
Runway Width	60'	60'	**75'**	100'	150'
Runway Shoulder Width	10'	10'	**10'**	20'	25'
Runway Blast Pad Width	80'	80'	**95'**	140'	200'
Runway Blast Pad Length	60'	100'	**150'**	200'	200'
Runway Safety Area Width	120'	120'	**150'**	300'	500'
Runway Safety Area Length Beyond RW End**	240'	240'	**300'**	600'	1,000'
Runway Object Free Area Width	250'	400'	**500'**	800'	800'
Runway Object Free Area Length Beyond RW End**	300'	500'	**600'**	1,000'	1,000'
Runway Obstacle Free Zone Width and Length	(length = runway length + 400'; width varies from 120' to 400')				

*Facilities for only small airplanes.

**The runway safety area and runway object free area lengths begin at each runway end. With the declared distance concept, these lengths begin at the stop end of each ASDA and both ends of each LDA, whichever is greater.

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 23 identifies the runway setback requirements selected and in use for the Oakdale Municipal Airport. These requirements have been adjusted to properly accommodate the layout and development of the runway and taxiway system and adjacent aircraft parking and building areas. The criteria identified in Table 23 meet or exceed the FAA standards presented in the previous tables. Runway setback requirements are indicated on the Airport Layout Drawing. For Oakdale Municipal Airport, the runway safety area (RSA) is centered on the runway and has a width of 300 feet to protect for conversion of the runway to "precision" beyond the planning period. In this area, no object may penetrate the volume of space above this zone except for necessary lighting and frangible-mounted navaids.

The building restriction line (BRL) defines the closest point to the runway that any building may be constructed. The minimum BRL is 250 feet each side of runway 10-28 and includes the runway protection zones. In practice, a building's height must also be considered before siting its location, and the requirements of Federal Aviation Regulations Part 77 satisfied regarding obstructions to navigable airspace. The BRL is designed to not only meet BRL requirements, but also prevent buildings or permanent objects from being placed inside the ROFA and RVZ. Furthermore, the BRL is set back far enough to prevent aircraft operational aprons from being blocked by unintentional placement of structures.

The runway obstacle free area (ROFA) is also shown. The following table summarizes the setback requirements for the runways.

Table 23
Runway Setback Requirements
Oakdale Municipal Airport

	Lateral Distance from Runway CL		
Runway	BRL	RSA	ROFA
10-28	250'	150'	250'

Source: Wadell Engineering Corporation

The Airport Layout Drawing shows the future fencing program necessary for proper operations of the airport. The purpose of a properly prepared fencing program is to minimize hazards to pedestrians and ground vehicles by separating them from aircraft as a safety measure. Furthermore, fencing allows for better definition of airport property and areas under lease to airport tenants. The fencing as shown on the layout drawings generally reflects perimeter fencing of the airport property, but also identifies fencing necessary in the terminal areas to separate aeronautical from ground base activities. In addition, fencing should be provided to keep out non-airport activities unless a suitable lease agreement and ingress/egress permit is established. Additional access control gates are shown on the plan.

Airspace Protection Plan

An Airspace Protection Plan in simplified format was prepared for the Oakdale Municipal Airport (see Exhibit 7). This supplements the Airfield Area Plan and provides plan view information for the runway approach areas. The corresponding technical presentation of the airspace is presented on the Airport Airspace Drawing and Runway Protection Zone Drawing in the Appendix of this report.

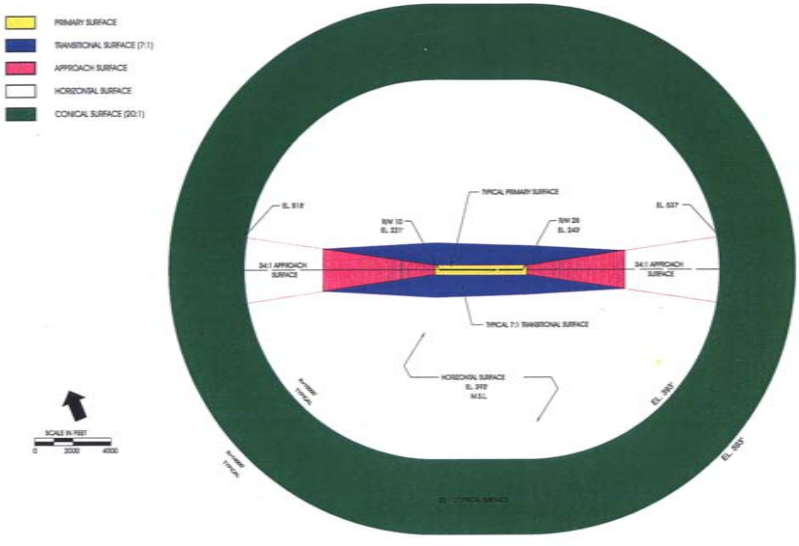


Exhibit 7
Approach Surface
Oakdale Municipal Airport Master Plan

A key function of these drawings is (1) to provide a basis for height zoning in the airport environs, and (2) to identify obstructions in the vicinity of the airport which may have an impact on the use of the runways and adjacent airspace. The drawings are prepared using criteria contained in Federal Aviation Regulations, Part 77, "Objects Affecting Navigable Airspace."

At Oakdale, the FAR Part 77 dimensional standards applied for runway 10-28 are those relating to "non-precision" instrument runways.

The Airspace Protection Plan shows imaginary primary, approach, transitional, horizontal, and conical surfaces. The primary surfaces surround the runways and extend 200 feet beyond the thresholds. The width of the primary surface is 500 feet for Runway 10-28. The elevation of the primary surface is the same as the runway centerline.

The approach surfaces rise from the ends of the primary surfaces. The slope of the surface is 34:1 with a length of 10,000 feet. The approach surface flares from an inner width equal to the primary surface to an outer width equal to 3,500 feet.

The transitional surfaces are sloped at 7:1 from the primary surfaces and approaches until intersecting the horizontal surface. The horizontal surface is 150 feet above the airport elevation and extends 10,000 feet from the primary surface of runway 10-28. At the limit of the horizontal surface, a conical surface of 20:1 slope and a 4,000 foot width completes the required protection surfaces for this airport.

Tables 24 and 25 present FAA standards for approach surface dimensions and runway protection zone dimensions.

The Airport Airspace Drawing and Runway Protection Zone Drawing, see the Appendix, indicates that the terrain surrounding the airport is sufficiently low so that it does not penetrate the imaginary surfaces. Existing buildings and trees in the terminal area penetrate the future primary surface. This will require either a waiver from the FAA or relocation if improved instrument approaches are implemented.

Table 24
Approach Surface Dimensions

ITEM	RUNWAY END		APPROACH SURFACE DIMENSIONS			
Airports Serving:	Approach End	Opposite End	Surface Length	Inner Width	Outer Width	Slope (H/V)
Small Airplanes Only	Visual	V	5,000'	250'	1,250'	20:1
		NP	5,000'	500'	1,250'	20:1
		NP 3/4 or P	5,000'	1,000'	1,250'	20:1
	Non-Precision	V or NP	5,000'	500'	2,000'	20:1
		NP 3/4 or P	5,000'	1,000'	2,000'	20:1
Large Airplanes	Visual	V or NP	5,000'	500'	1,500'	20:1
		NP 3/4 or P	5,000'	1,000'	1,500'	20:1
	Non-Precision	V or NP	**10,000'**	**500'**	**3,500'**	**34:1**
		NP 3/4 or P	10,000'	1,000'	3,500'	34:1
Large or Only Small Airplanes	Non-Precision 3/4	V or NP	10,000'	1,000'	4,000'	34:1
		NP 3/4 or P	10,000'	1,000'	4,000'	34:1
	Precision	V or NP	10,000'	1,000'	4,000'	50:1
		NP 3/4 or P	50,000'	1,000'	16,000'	50:1/40:1

Legend:

V = Visual Approach
NP = Nonprecision instrument approach with visibility minimums more than 3/4 statute mile
NP 3/4 = Nonprecision instrument approach with visibility minimums as low as 3/4 statute mile
P = Precision instrument approach

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Table 25
Runway Protection Zone (RPZ) Dimensions

ITEM	RUNWAY END		DIMENSIONS FOR APPROACH END			
Airports Serving:	Approach End	Opposite End	Zone Length	Inner Width	Outer Width	RPZ (acres)
Small Airplanes Only	Visual	V	1,000'	250'	450'	8.035
		NP	1,000'	500'	650'	13.200
		NP 3/4 or P	1,000'	1,000'	1,050'	23.542
	Non-Precision	V or NP	1,000'	500'	800'	14.922
		NP 3/4 or P	1,000'	1,000'	1,200'	25.252
Large Airplanes	Visual	V or NP	1,000'	500'	700'	13.770
		NP 3/4 or P	1,000'	1,000'	1,100'	24.105
	Non-Precision	V or NP	**1,700'**	**500'**	**1,010'**	29.465
		NP 3/4 or P	1,700'	1,000'	1,425'	47.320
Large or Only Small Airplanes	Non-Precision 3/4	V or NP	1,700'	1,000'	1,510'	48.978
		NP 3/4 or P	1,700'	1,000'	1,510'	48.978
	Precision	V or NP	2,500'	1,000'	1,750'	78.914
		NP 3/4 or P	2,500'	1,000'	1,750'	78.914

Legend:

V = Visual Approach
NP = Nonprecision instrument approach with visibility minimums more than 3/4 statute mile
NP 3/4 = Nonprecision instrument approach with visibility minimums as low as 3/4 statute mile
P = Precision instrument approach

Source: Wadell Engineering Corporation, based on FAA Advisory Circular 150/5300-13

Terminal Area Plan

The Terminal Area Plan, see Exhibit 8, was prepared after completion of the Forecast, Demand/Capacity Analysis, and Facility Requirements section of this report. The plan was developed simultaneously with the Airfield Plan to assure workability within the total plan, as well as appropriate integration in the staging process. An effort was made to achieve balance between operating convenience and efficiency with facility cost.

The terminal area includes the aircraft parking aprons, T-hangar areas, FBO areas, terminal building, fueling facilities, and other aviation-related facilities and services. Some considerations in development of the terminal plan are:

- Proper use of existing facilities
- Proximity of utilities
- Auto access and circulation
- Impacts on surrounding land uses
- Operating efficiencies and safety
- Development costs
- Business viability
- Passenger convenience and comfort
- Aircraft operational requirements
- Flexibility for future change

The existing terminal area apron at Oakdale consist of approximately 4.5 acres of pavement with a capacity of 52 tiedown spaces. A breakdown of this apron area shows that 6 spaces are located on the ramp in front of the central FBO hangar. Forty-six additional aircraft parking spaces are on the west apron.

The present pattern for aircraft parking is for transient aircraft to park in areas nearest the terminal building. The aircraft parking is of the "power-in, power-out" type to provide convenient and efficient maneuvering of aircraft. Based aircraft parking is "tail-to-tail" to allow optimum spacing commensurate with apron size and construction costs.

The existing 52 aircraft parking spaces are adequate to serve the existing terminal area through the year 2015. If additional hangar facilities are not provided, there will be a greater demand for tiedown spaces, yet space is available.

There is a continuing need for hangar space at Oakdale Municipal Airport. The existing 35 hangar spaces do not satisfy the current demand. Future T-hangars are proposed for the area east of the current hangar area, and on the northside of the westerly apron.

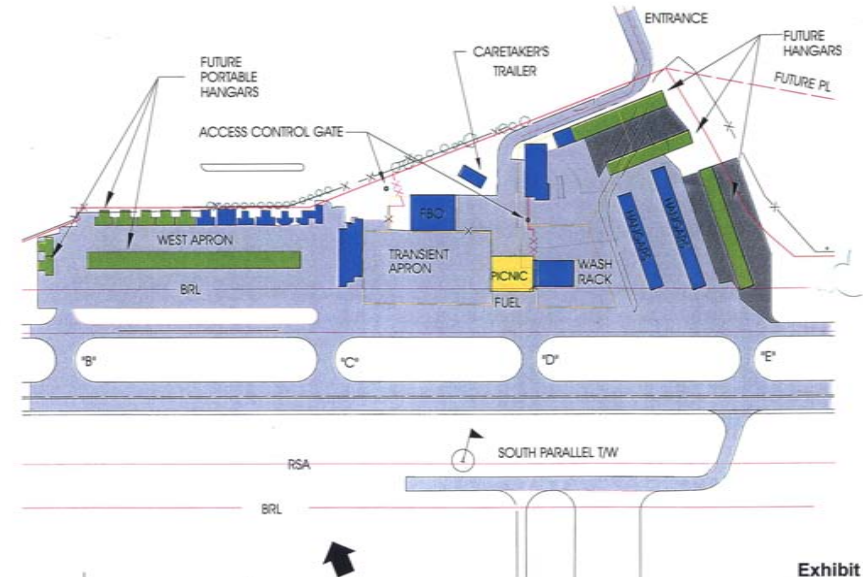


Exhibit 8
Terminal Area Plan
Oakdale Municipal Airport Master Plan

There are sufficient FBO facilities currently, and throughout the planning period. Additional FBO's will only reduce the number of based aircraft per FBO, resulting in down sizing and lesser service by each FBO in order to operate economically.

The present two FBO buildings with lobby areas are more than adequate to satisfy the current and future needs of the airport. The functions served in these areas include public waiting area for general aviation pilots and passengers, flight planning, sales of aviation materials, and snacks.

The Oakdale Municipal Airport has off-site fire protection by the City fire department. The airport's fire protection system includes ground level fire water storage tanks with pumping system. This system is connected to a network of fire hydrants in the terminal area.

The fire protection which is now available for the airport is adequate throughout the planning period. Since no air carrier activities are expected, it is not required that the City provide an aircraft rescue and fire fighting facility (ARFF). The City could acquire an on-airport pickup truck loaded with a purple K fire system as an added measure of safety.

Access Plan

Oakdale Municipal Airport is located about two miles east of the Oakdale city limit along two lane Sierra Road. Access to the airport is via Laughlin Road from Sierra Road. Although two miles east of the city limits of Oakdale, the airport site itself is in a separate precinct owned by the City. Airport access is considered good since the airport is far enough from the more urban areas for compatibility, yet close enough for convenient ground access.

There are two automatic controlled access gates to the terminal facilities, one near the west T-hangar and apron area, and the other near the central FBO hangar. Only authorized parties have access.

Presently, there are approximately 25 spaces for auto parking in the terminal area. The forecast need for future auto parking totals 40 spaces. There is ample area for additional auto parking, both in the existing areas and in the apron and hangar areas. Aircraft owners should be allowed to park their vehicles adjacent to the apron and hangar areas to provide convenient access, allow security for their parked vehicle while out of town, and to reduce the need to construct additional perimeter parking areas. The construction of additional parking should be planned to coincide with demand as it occurs.

Land Use Plan

Land use planning, both on and off the airport, is essential for establishing appropriate development areas on the airport and determining suitable and compatible uses for off-airport land development. A land use plan provides goals and objectives relating to protection and utilization of the land resources, development consistent with the needs and service levels of the community, and constraints to development based upon the local conditions. General adherence to land use plans, their goals, and their objectives will permit the orderly development of an airport and the surrounding area.

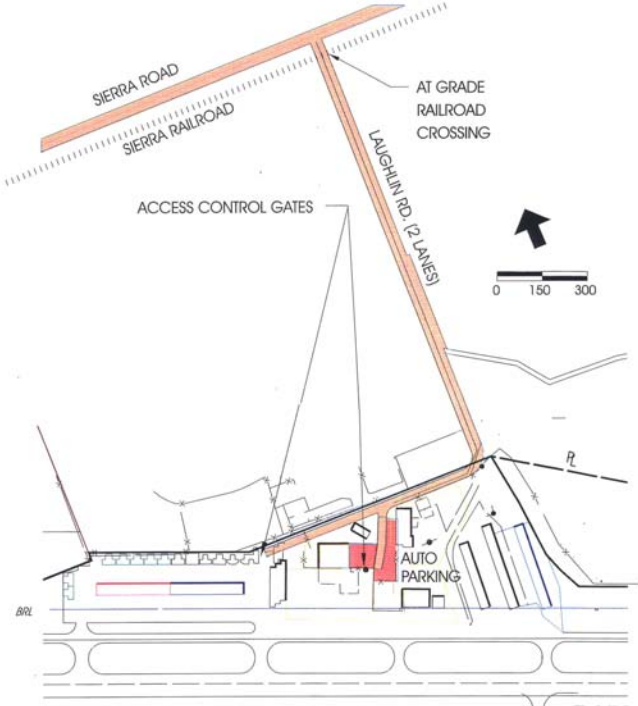


Exhibit 9
Access Plan
Oakdale Municipal Airport Master Plan

WADELL ENGINEERING CORPORATION

On-Airport

Identifying existing and recommended land uses within the ultimate airport boundary is necessary to provide the adequate control and management of the airport facility. The future land uses depicted in an on-airport land use plan are developed through analysis of the specific aviation needs of the airport. The development of land use plans for an airport can ensure the compatibility among the airport users and the efficient development of airport property. An on-airport land use plan is intended to serve as a broad guideline to assist in fulfilling the primary aviation needs of the airport. As future needs arise, an airport can apply the provisions of the master plan and its land use plan to each phase of development. If necessary, consideration should be given to determine the need to revise the master plan and land use plan as more information regarding actual airport use becomes available.

For the purposes of the Oakdale Municipal Airport Master Plan, several on-airport land use designations have been defined. These land use categories include the following:

- Airfield: Runways, taxiways, runway protection zones, approach areas, and land within the building restriction lines.
- General Aviation Commercial: Fixed based operator (FBO) facilities involving the sale of general aviation products and services to the general public and limited service commercial facilities, such as avionics sales and repair shops, aircraft paint shops and aircraft maintenance facilities.
- General Aviation Non-Commercial: Facilities for the basing and servicing of aircraft owned by individuals or organizations. To be used solely for the benefit of the private aircraft owner.
- Airport Support: Facilities that provide airport-related services, such as airport administration, airport maintenance, aviation fuel facilities, pilot lounge and general services facilities, and aircraft rescue and fire-fighting facilities (ARFF).
- Aviation-Related: Land which may accommodate aviation-related or aviation-compatible uses such as automobile rental agencies, airport restaurant, motel, or other commercial use to produce revenues for the airport. Such use must be compatible with and not interfere with the existing aviation uses at the airport.
- Reserved for Future Requirements: Land that may possibly not be required within the master planning time frame, but should be reserved for potential long-range development of airfield, general aviation, or airport support facilities.
- Future Acquisition: Land that should be acquired to protect the ultimate capacity of the airport site, including existing out parcels and large areas for future airport expansion and approach protection.

The land uses depicted on Exhibit 10 are based upon the descriptions as presented above. The designated land uses and their locations are intended to be a broad guideline for future airport development based upon the forecast needs as developed in this Master Plan. Because airport needs can change dramatically over time, this land use plan should be used as a guideline and, if warranted by changes in the aviation demand and character, should be modified to reflect the ongoing needs of the airport.

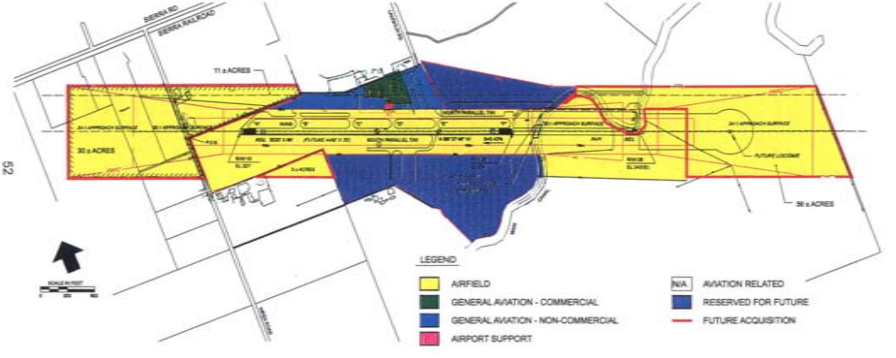


Exhibit 10
On-Airport Land Use
Oakdale Municipal Airport Master Plan

Off-Airport

The basic responsibility for off-airport land use planning is with the City of Oakdale and the Stanislaus County. The objective of off-airport land use planning is to guide safe, compatible land uses around airports. Aviation-related factors to be considered and evaluated when planning land uses or redeveloping lands adjacent to airports include:

- Aviation noise and its effects on people.
- Safety of persons on the ground.
- Safety of pilots.

Many forms of urban development can cause conflict with aircraft operations. Airspace obstructions such as buildings and transmission lines can significantly decrease airport safety and capacity. Electrical interference can restrict the use of communications and navigation equipment. Offsite lighting can make it difficult for pilots to distinguish between airport lights and others. Developments such as garbage dumps, sewage lagoons, and certain vegetation which attract birds, can create bird-strike hazards. In addition, smoke, odors, and intensive noise each have separate and negative impacts on airport operations. The accumulation of these and other factors can reduce and sometimes eliminate the usefulness of an airport.

Since an airport can attract a variety of land uses, planning for the airport environment attempts to encourage activities best able to take advantage of a location near an airport. This involves two approaches: (1) the prohibition of uses negatively related to the airport, and (2) the encouragement of uses benefited by an airport location. Those uses most attracted to the airport are generally those least bothered by noise and other annoyances. The presence of these attracted uses acts as a buffer to uses which are negatively affected. Compatible land uses near airports typically have one or more of the following characteristics: they are (1) land uses involving few people, such as natural or open areas, (2) uses which are noisy, such as industries, (3) indoor uses, especially commercial and industrial use, which can be protected from noise by sound reduction construction, and (4) airport-related uses.

The area affected by airport operations is normally termed the airport's "environs." Generally, aircraft noise is the principal consideration in determining an airport's area of influence, but other factors such as safety of pilots and persons on the ground, local circulation systems, area development plans, and terrain are often included in the formulation of the influence area. Within the airport environs, planning and zoning authority provide the ability to preserve opportunities for airport development and minimize off-airport land use incompatibility. With a clear policy established regarding land use in proximity to an airport and with the regulatory mechanisms to assure implementation of that policy, off-airport development decisions can be made easily and rapidly. Unfortunately, the importance of this approach is often misunderstood or disregarded.

Key elements of the Oakdale Municipal Airport Master Plan update affecting land use decisions in the airport include:

- Increases in aviation activity.
- The proposed extension of runway 10-28 from 3,020 feet in length to 4,400 feet.
- Modifications to the approach and runway protection zones, FAR Part 77 surfaces, and safety areas as a result of the proposed runway extension.
- Land acquisition for runway approach protection and expansion.

Land Use Control Strategies

Local land use plans, ordinances and policies are the principal means for ensuring land use compatibility in the vicinity of an airport. Various land use control strategies that can be used in the Oakdale Municipal Airport environs are described below.

The City of Oakdale and the Stanislaus County can act to prevent adverse noise and safety conditions from occurring in the airport environs, and to protect the airport from encroachment by incompatible land uses through the adoption of the new Oakdale General Plan and the Stanislaus County General Plan.

In addition to considering potential aircraft noise impacts, the City and County can also adopt specific airport safety, height, and obstruction clearance criteria. These standards are set forth in Federal Aviation Regulations, Part 77 (FAR Part 77). Both the City of Oakdale and Stanislaus County have adopted airport approach zoning ordinances which regulate and restrict the height of structures and objects, and regulate the use of airspace in the vicinity of the airport. Updated ordinances will be needed for the new airport master plan.

Aircraft Noise

A major potential conflict between continued airport use and off-airport development centers on noise impact. The FAA's Integrated Noise Model (INM), Version 4.11 was used to perform calculations and produce contours of equal noise exposure for this study. Noise exposure maps for 1995 operational conditions and 2015forecast conditions are set forth below. The noise modeling conducted for this study was supported by thorough inventory, use and documentation of all pertinent variables which influence aircraft noise generation.

Key variables in the noise modeling effort included existing and forecast aircraft activity levels, aircraft types, time of day of operations, flight tracks, and flight procedures in use, among others. Data describing these variables was arranged and input to the computer model to produce contours of equal cumulative noise levels expressed in Community Noise Equivalent Level (CNEL) metric. CNEL is the methodology specified in the California Airport Noise Standards. CNEL adds an additional 5dB penalty to events occurring during evening hours, and an additional 10dB penalty during nighttime hours to account for increased annoyance.

Information on current 1995 were estimated, since actual counts do not exist.

Forecast activity levels for the year 2015 were derived from the updated Airport Master Plan. Table 26 sets forth average day aircraft operations by aircraft classes used in noise modeling assumptions for 1995 and 2015. As can be seen from Table 26, average day aircraft operations are forecast to increase by 40 percent between 1995 and 2015. Forecast noise contours for the year 2015 allow for these increased operations as well as for anticipated changes in the aircraft fleet mix using the airport.

Table 26
Average Day Operations By Aircraft Class
Oakdale Municipal Airport

ITINERANT*	1995	2015
Lt. Turbofan (Lear 35)	0	1.2
Lt. Quiet TF (Cessna 500)	0.6	1.7
Turboprop (Kingair)	1.8	4.6
Twin-Eng. Prop (B-58)	1.5	3.1
Single-Eng. Prop. (C-172)	52.0	68.4
Subtotal	56.0	79.0
LOCAL/T&G		
Twin-Eng. Prop.	4	6
Single-Eng. Prop.	40	56
Subtotal	44	62
TOTAL	100	141

* Aircraft types are representative and for informational purposes only.

Table 27 shows general land use designations along with guidelines on compatibility with specific aircraft noise levels. The designations contained in this table do not constitute a determination that any use of land covered by the table is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. Land uses determined to be appropriate by local authorities in response to locally determined needs and values may be inconsistent with the guidelines in this table.

State of California airport noise standards as well as Federal Aviation Regulations (Part 150) establish a CNEL of 65 dBA as the maximum acceptable noise exposure for residential land uses. This criterion is set primarily with regard to air carrier airports in urban locations. For typical general aviation airports and less noisy suburban or rural settings, a 60 CNEL standard can be used.

CNEL noise contours for current conditions (1995) and future conditions (2015) were calculated. Exhibit 11 shows the current 1995 CNEL situation. The future 2015 conditions were analyzed with and without the recommended runway extension. It was found that there was improvement in the CNEL contours with the extension, since the most active runway 28 end will shift east away from developed areas. Exhibit 12 shows the 2015 contours with the runway extension.

Currently there are some residences north of the runway, yet they are clear of the 65 CNEL contour.

Table 27
Land Use Compatibility Guidelines

Land Use	Below CNEL 65	CNEL 65-70	CNEL 70-75	CNEL 75-80	CNEL 80-85	Over CNEL 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail–building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade–general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

CNEL = Community Noise Equivalent Level
Y (Yes) = Land Use and related structures compatible without restrictions
N (No) = Land Use and related structures are not compatible and should be prohibited
NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35 = Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Land Use Compatibility Guidelines Table:

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR or 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(4) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(5) Land use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

Source: Wadell Engineering Corporation, based on FAA Regulations Part 150, "Airport Noise Compatibility Planning," Revised January 18, 1985.

Safety

In addition to the airport noise as a consideration in planning compatible land uses, it is important to consider safety from two different perspectives: people who may live or work in the area around the airport and pilot/aircraft safety.

The proposed Airport Master Plan sets forth only one major capital development measure that could affect safety and off-airport land use. This is the easterly extension of Runway 10-28 from 3,020 feet to 4,400 feet. The Airport Layout Drawing depicts the proposed runway extension.

The principal effect of the runway extension would be to extend the FAR Part 77 surfaces for Runway 28 by 1,380 feet to the east. The Airport Airspace Drawing sets forth the new approach and runway protection zones which have been modified to accommodate the proposed runway extension by shifting the Runway 28 approach and protection zones, and FAR Part 77 imaginary surfaces to the east. Given that the area over which the Part 77 surfaces have been modified is undeveloped agricultural land, the net effect of the proposed runway extension on air safety, obstruction clearance, and hazards to navigation is positive.

There have been occasional aircraft incidents and accidents at the Oakdale Municipal Airport. In 1994 there were two serious accidents, one involving the crash of a twin engine aircraft on a training flight, and the second the crash of a single engine aircraft also on a training flight. The single engine aircraft came to rest in the Oakdale Irrigation District canal just over 200 feet east of the runway 28 threshold. The runway extension will include covering the canal within the runway safety area, and provide a longer runway for twin engine aircraft. This is a high priority airport safety project.

Land Use and Recommended Changes

Land in the airport environs is controlled by either the City or Stanislaus County. There are no current or anticipated land use incompatibilities, since the airport is located east of the most developed portions of the City.

It should also be noted that Stanislaus County does not have an Airport Land Use Commission (ALUC), which is the usual vehicle for reconciling the overlapping interests of city agencies and land use designations with those of the county. No formal Airport Land Use Plan (ALUP) has been formulated for Oakdale Municipal Airport. However, it is recommended that the City and County adopt the Draft Airport Approach Zone Regulation that would accomplish the same purpose as an ALUP. The City and County should also coordinate their land use designations for the airport vicinity in the current updates of their respective General Plans.

In the accomplishment of the above, this Master Plan recommends that no land in the immediate airport vicinity be designated or zoned for incompatible uses such as residences, schools, hospitals, and the like.

- Amend Airport Approach Zoning Regulations to accommodate changes to the FAR Part 77 imaginary surfaces, approach and runway protection zone surfaces, and building restriction line as a result of implementation of the proposed runway extension.

- Use the 2015 Noise Exposure Map as the basis for assessing the compatibility of proposed noise sensitive development in the airport environs.

- Make a consistency determination on the Oakdale 2005 General Plan Update by the Oakdale City Planning Commission.

- Update the existing ALUP for Oakdale Municipal Airport to reflect the 1990 noise exposure levels, the Master Plan update, and recent modifications to the ALUC requirements.

- No other policy elements of the City General Plan need be modified at this time. It is recommended that the existing "airport environs" definition be retained, as well as the Airport Area of Influence and Referral Area.

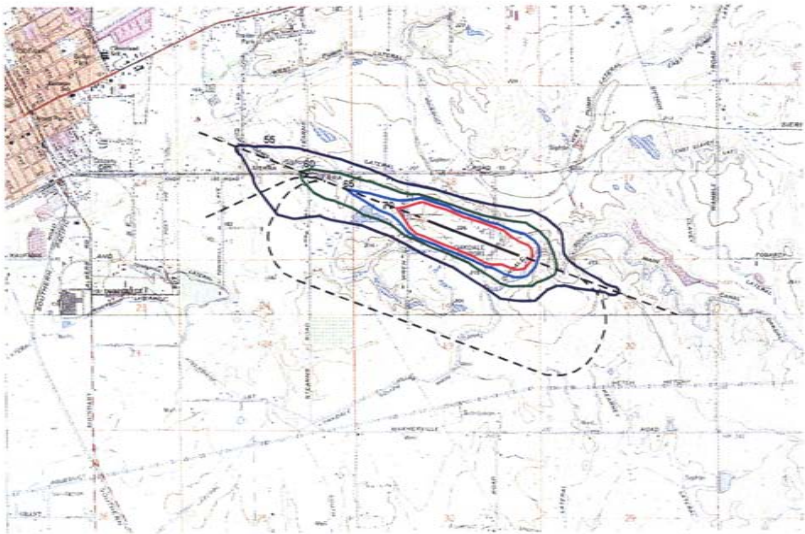


Exhibit 11
Current CNEL Contours
Oakdale Municipal Airport Master Plan

WADELL ENGINEERING CORPORATION

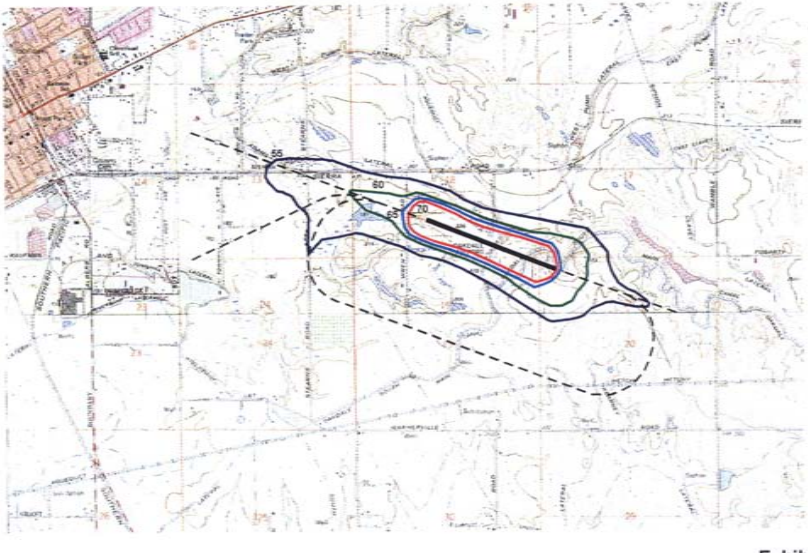


Exhibit 12
Future CNEL Contours
Oakdale Municipal Airport Master Plan

6. IMPLEMENTATION PLANS

The Implementation Plans chapter contains information concerning the capital improvement program, the financial program, and the implementation schedule. The Implementation Plans are prepared based upon (1) the facilities required to accommodate forecast demand, and (2) the development of those facilities as discussed in Chapter 5, Airport Plans.

Capital Improvement Program

The Capital Improvement Program is comprised of (1) stages of development, and (2) cost estimates of improvements proposed in this Master Plan study. The development program is presented in three stages so that all projects can be undertaken when demand justifies development. The cost estimates are prepared in current dollars, and are to be used for planning purposes only.

Stage Development

The projects of the first stage of development, 0-5 years, are (1) land acquisition for the extension of Runway 10-28 to the east, (2) irrigation channel relocation and structures under the extended runway and taxiway, (3) earthwork and drainage for the runway extension, (4) extension of the runway 75 feet wide by 1,380 feet long with lighting, and (5) extension of the parallel taxiway system with lighting. Additional projects include development of T-hangars with taxiways and fuel farm replacement.

The Capital Improvement Program Cost Summary Table on the following page shows that the most significant expenditures during the 20-year capital improvement program occur in Stage I. These expenditures are needed for the runway extension, associated taxiway and lighting systems, and T-hangar development.

The second stage of development, 6-10 years, includes (1) additional hangars with taxiways, and (2) a localizer/DME navaid.

The third stage of development, 11-20 years, primarily concerns (1) additional hangar development, and (2) hangar taxiways.

Cost Estimates

The following Capital Improvement Program Cost Summary, Table 28, indicates the costs for each stage of development for the airport. Table 29 identifies projects within each time frame. Order of magnitude costs are indicated for planning purposes only. The project costs are separated as to FAA share and local share. The FAA portion is based on 90 percent funding. It is possible that certain items such as navaids may be eligible for 100 percent funding through the FAA Facilities and Equipment (F&E) Program. The local share is normally 10% of eligible projects, and 100% of non-eligible projects. Items presently not eligible for FAA funds include revenue producing auto parking, hangar and FBO buildings, fueling systems, and utilities serving ineligible facilities. All eligibility is subject to FAA review and the outcome of future legislation.

For the purpose of this cost estimate, it is assumed that the FBO's will maintain their own auto parking and maintenance aprons in conjunction with their buildings, and the City will develop all T-hangars and fueling systems.

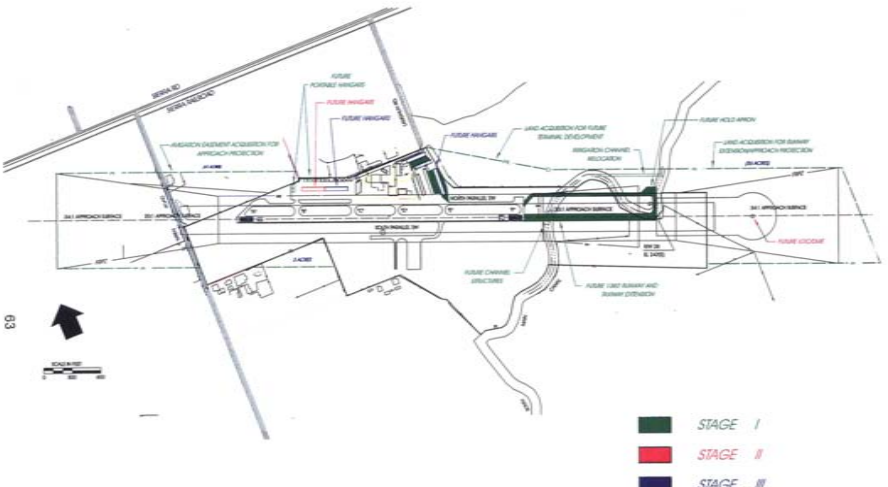


Exhibit 13
Stage Development Plan
Oakdale Municipal Airport Master Plan

Definitions of capacity in planning manuals incorporate a reasonable amount of maximum delay. The timing of development indicated provides airfield development benefits commensurate with costs. Each improvement is timed with respect to safety to users and with the goal of commencing facility development, preferably two to three years before demand exceeds capacity. Construction prior to the operational dates may occur depending upon the availability of funds, changes in demand, and other opportunities.

The airport land and easement acquisition program should take place before the need for the land is needed for construction, therefore acquisition is identified as occurring in 1997. The acquisition program includes purchase of land for the Runway 10-28 extension and the runway protection zones at the Oakdale Municipal Airport. The land values in Oakdale are subject to escalation and change. Values may escalate at an increasing rate as the area becomes more urbanized. Values per acre were used as approximations; actual values are unknown since appraisals are beyond the scope of work of this study.

All construction and land acquisition costs are based on 1995 dollar values. Quantities are for minimum acquisition and improvements necessary to provide acceptable facilities to meet forecast demands. For planning purposes, the multipliers presented below may be applied to estimate future construction costs, although the future economy cannot be exactly projected. These escalations are based on an extrapolated average annual increase at 5 percent compound interest.

Range in Multiplier of 1995 Costs	
1995-2001	1.0 to 1.3
2001-2005	1.4 to 1.8
2006-2010	1.9 to 2.3
2011-2015	2.4 to 2.9

There are many uncertainties with respect to forecasting costs, especially in long-range plans. The airport owner should incorporate adequate contingencies to cover changes in costs, sophistication of equipment, environmental protection requirements, and special studies or programs. Cost estimates are order of magnitude costs for planning and programming purposes only. Detailed topographic mapping, soil investigations, and field investigation during the design process will result in more accurate estimates of future development costs.

Grant applications should be made for development of portions of the improvement program to complete specific sub-areas of the airport. Improvement programs must be realistic and comply with FAA and local funding limitations; therefore, some projects may have to shift to subsequent time periods, if funding is not available.

Table 28
Capital Improvement Program Cost Summary
Oakdale Municipal Airport
(In 000's 1995 $)

Stage I (1995-2000)	$2,522,300
Stage II (2001-2005)	$512,500
Stage III (2006-2015)	$207,100
Total	$3,241,900
FAA/State Funds	$2,548,100
Local Funds	$693,800
Total	$3,241,900

Source: Wadell Engineering Corporation

TABLE 29
CAPITAL IMPROVEMENT PROGRAM COST ESTIMATES
OAKDALE MUNICIPAL AIRPORT
(in 000's 1995 $)
(As of 10-20-95)

Year	Stage	Total	FAA Share	Local Share
	STAGE 1:			
1995	Hangars (7)	52.5	0.0	52.5
1996	Fuel Farm Replacement	75.0	0.0	75.0
1996	Irrigation Channel Structure - Runway Safety Area	562.5	506.3	56.2
	Subtotal	$690.0	$506.3	$183.7
1997	Land Acquisition	$300.0	$270.0	$30.0
1998	Runway Extension Earthwork	343.8	309.4	34.4
1998	Runway Extension Drainage	50.0	45.0	5.0
1999	Runway Pavement Extension (75'X1380')	323.4	291.1	32.3
1999	Runway Pavement Widening (9'x3,020')	84.9	76.4	8.5
	Subtotal	$802.1	$721.9	$80.2
1999	Runway Lighting Extension	25.0	22.5	2.5
1999	Runway End Identifier Lights (REIL)	37.5	33.8	3.7
1999	Runway 28 PAPI	25.0	22.5	2.5
	Subtotal	$87.5	$78.8	$8.7
2000	Irrigation Channel Structure - Taxiway Safety Area	300.0	270.0	30.0
2000	Parallel Taxiway Pavement Extension & Hold Apron	189.7	170.7	19.0
2000	Parallel Taxiway Lighting Extension	40.5	36.5	4.0
2000	Lighted Airport Signing	112.5	101.3	11.2
	Subtotal	$642.7	$578.5	$64.2
	TOTAL STAGE 1	$2,522.3	$2,155.5	$366.8
	STAGE 2:			
2001	Localizer / DME Navaid	375.0	375.0	0.0
2001	Hangars (5)	37.5	0.0	37.5
2005	Hangars (5)	100.0	0.0	100.0
	TOTAL STAGE 2	$512.5	$375.0	$137.5
	STAGE 3:			
2010	Hangars (5)	93.8	0.0	93.8
2010	Hangar Taxiways	19.5	17.6	1.9
2015	Hangars (5)	93.8	0.0	93.8
	TOTAL STAGE 3	$207.1	$17.6	$189.5
	GRAND TOTALS:	$3,241.9	$2,548.1	$693.8

Notes: Order of magnitude cost estimates including 25% administration and engineering.
For planning purposes only, subject to design.

Source: Wadell Engineering Corporation

Financial Program

Local Benefits Assessment

General aviation airports contribute significantly to the prosperity of a community and are crucial elements in the economic well-being and safety of a city, county, and region. Today, general aviation is the largest, most far reaching, and a most significant segment of America's air transportation system.

The role and function of a general aviation airport differs from one location to another. Leisure travel is only one use of a general aviation airport. Aircraft are used for firefighting and monitoring weather conditions and air quality levels. General aviation airports play an important role in medical evacuations, law enforcement, and mail delivery.

The advantages and benefits of air carrier service to a community are readily apparent. But direct and indirect benefits of general aviation and other airport-related services may be more difficult to assess. General aviation airports such as the Oakdale Municipal Airport generate employment, sales taxes, personal property taxes, and increased consumer spending within the area. A recurring consequence of an airport's growth or facility expansion is an increase in the number of local jobs and stimulated economic activity.

Indirect employment results from services and businesses supporting the airport and its employees if business potential is developed. Growth of the airport means more dollars spent locally.

General aviation aircraft operating expenses are indicative of money being spent at an airport that eventually finds its way into the community. For each based aircraft there are dollars spent annually for fuel, oil, insurance, hangars/tie-downs, and routine maintenance. Table 30 shows the potential for aviation businesses in the area if the airport has adequate space and facilities available.

Table 30
Potential General Aviation Aircraft Expenditures
Oakdale Municipal Airport

Aircraft Type	Cost/ Hour	Average Hours Flown	$/Based Aircraft	Total Expenditures (in 000's $) 1995	2000	2005	2015
Single	$ 35	133.4	$ 4,670	$238	$257	$275	$318
Multi	125	181.1	22,640	68	69	91	113
Helicopter	250	423.3	105,825	0	0	105	212
Turboprop	350	447.9	156,765	157	313	313	470
Turbine	700	405.0	283,500	0	0	284	567
Estimated Total Amount Spent by Aircraft Owners				$463	$639	$1,068	$1,680

Source: Wadell Engineering Corporation

An airport interacts with and enhances the economic life of the community. Traditionally, a community's well-being has been tied to either transportation or communications. In the growth of the United States, those towns and cities located along railways grew and prospered while others without access to good transportation routes faltered and died. The same case can be made for aviation.

Everyone is aware of the time-saving value of aircraft travel. Not everyone realizes the indirect economic values produced by air travel. In the fast-moving business world, travel by corporate aircraft to close business deals can take only a few hours, with departure back to the home office on the same day without ever drawing the attention of anyone in particular. Yet, the consummation of that business deal, which might not have occurred without the local airport, will have a vital effect on the area's economy.

General aviation activity represents almost 50 percent of the aircraft miles flown annually. General aviation transports one-quarter of the people traveling by air who conduct business and provide industrial and agricultural services. A full spectrum of general aviation services and facilities at a local airport encourages visitors and acts as an incentive for business and industry to locate in the area.

Financing Considerations

A sound financial program is instrumental to the successful development of the airport. Proper planning, design, and feasibility studies are efforts spent in vain unless an adequate financing program can be developed to accomplish the improvements indicated. The goals of airport financial planning are to (1) achieve a sound economic operation, (2) provide an adequate level of public facilities, and (3) avoid taxpayer burdens by developing a reasonable financial return from the airport facility. The desirability of future airport development depends on the ability of an airport to achieve a self-supporting status and, within a reasonable time, to cover local development costs. Estimated revenues must be sufficient to help offset annual cost of capital investment and operations.

While the primary responsibility for financing proposed facility development rests with the sponsor, there are many ways that airport development funds can be supplemented. Money for capital improvements may come from a number of sources and may be used singly or in combination to accomplish airport development. Sources available during recent years for financing airport facilities include the FAA's Airport Improvement Program (AIP), the State of California Department of Transportation, private donations, leasebacks, direct revenue loans, certificates of participation, and revenue and general obligation bonds. Also, capital improvements can be financed from general funds that are provided by annual operating and tax revenues.

Federal Aviation Administration funds for airport development are derived from user taxes and are available for land acquisition, construction, alteration, fire fighting, and rescue vehicles and facilities, as well as for establishing and improving air navigation facilities. Both publicly-owned and privately owned public use airports are eligible for such aid provided the proposed project is included in the National Plan of Integrated Airport Systems (NPIAS). The airport is in the NPIAS. Presently, the Federal share of these projects in California is 90 percent of eligible costs. In recent years, the annual general aviation funding in California by the FAA has been approximately $12 million, yet funding requests greatly exceed the available funds, even though the FAA has a $8 billion unspent trust fund surplus.

The California State Aeronautics Division provides funds for airport development, also collected from aviation users. The primary areas of assistance are for maintenance of runways, taxiways, aprons, lighting, and other aircraft operational areas. The state aid is usually 90 percent of eligible project costs. Currently, the California Division of Aeronautics provides approximately three million dollars annually for the entire state. The state has a loan fund for development of hangars, fueling systems, and to provide one-half of the local match for FAA grants. The interest rates are approximately 7% per year.

A non-profit corporation could lease portions of the airport, construct facilities, and then lease the entire improvement back for a fixed period of years, calculated to recoup the investment plus interest. Rates will be high, but no initial public capital is required for this form of financing. Private enterprise is not eligible for Federal/State grants. The rate of return to the airport is relatively low.

Certificates of Participation (COP) is a long-term financing technique using either a lease purchase or installment sale arrangement. While usually used for long-term financing of major facilities such as city or county administration, public safety, court house, jail, and parking garage buildings, it has also been used to finance equipment over a 3 to 10 year period. The parties of the transaction include (1) the lessee, which is the public body; (2) the lessor, which can be a non-profit or private leasing corporation or a public agency; (3) the trustee, who holds the security for the payments of the lease; (4) the paying agent (who may be the same as the trustee), who disburses the lease payments to (5) the investors, who purchase the COPs. The funds to meet the lease payments are raised on an annual appropriation basis and non-appropriation may mean the return of the asset financed or action at law or in equity. As further security for the lease payments, insurance or a third-party guarantee may be used or project revenues may be used to make lease payments if the facility is revenue-producing.

Municipal Lease Purchase Financing (tax-exempt leasing) is an alternative method for financing public use and acquisition of equipment or facilities otherwise too expensive to be included in annual budgets. Leasing permits political subdivisions to enter into installment sale or lease purchase contracts with principal and tax-free interest increments payable over time. Tax-exempt lease contracts have two requirements: (1) the governmental body must pay the purchase price plus interest over a period of years, and (2) it must have the right to purchase the property for a nominal price at the end of the contract term. The funds to pay the contract installments can come from any source available to the public body. The appropriation is put in the annual budget. Should the appropriation not take place, the balance due on the contract is accelerated and the investor either receives back the asset for which the funds were spent or otherwise seeks relief.

Revenue bonds are sold with repayment based on income from anticipated revenues. Adequate earning capability of the project must be convincingly demonstrated. Earnings from the airport must go first toward retirement of the bonds, and future financing may be inhibited while bond debt is outstanding. Interest rates are usually higher than for general obligation bonds. Revenue bonds are an excellent form of financing for air carrier runways, terminal buildings, and industrial parks, but are not frequently used for most general aviation development. For general law cities and counties in California, an election is required to authorize the issuance of revenue bonds. A majority vote is required.

General obligation bonds are backed by the taxing power of the community and are generally the most economical bonding method to finance airport development. Proceeds from the sale of general obligation bonds are usually not available to finance private or exclusive operation facilities such as FBO facilities, T-hangars, and exclusive-use aprons. General obligation bonds are useful in financing public use facilities whether revenue producing or not, such as runways, taxiways,

terminal buildings, and auto parking. An election is required to authorize the issuance of general obligation bonds. A two-thirds majority vote is required.

Financing airport improvements directly from the airport enterprise fund is the most economical method of all, since there are no interest payments. Airport improvements financed by this approach could place constraints on money available from the airport fund to meet normal operating and other expenses.

An airport authority is commonly developed when one public agency is burdened with total airport costs, while other communities have the benefits and even taxation, but not the costs. A new district or authority could not create new taxes, but could sell lease-revenue bonds.

For the City of Oakdale funding from the FAA and State combined with revenues from the airport fund is the most cost effective and practical method of airport development. Municipal leasing, COP, or state loans are the best sources of funding for airport hangars, with repayment from the airport fund.

The current airport ownership by the city is most practical, since the airport is too small for formation of an authority, and while it serves an area greater than the city limits, it primarily serves city residents.

Cash Flow Analysis

Pricing of airport services and facilities is a sensitive issue and subject to controversy. Each party may have a different perspective and motivation. While a public entity may seek a yearly return equal to yearly expenditures, private business may seek to maximize profits, and some airport users feel that a facility supported by public funds should be willing to charge less and even sometimes operate at a deficit. Local governments have to cover costs, or must accept a deficit with the view that other community revenues are increased adequately to warrant a deficit.

Many airports seek to attain a high degree of self-sufficiency and have rates and charges commensurate with the operating costs and capital improvement expenses. At other airports, local conditions and circumstances preclude charging full actual costs and a public entity may choose to absorb some of the financial burden and not pass it on to the user.

The preceding section on financing considerations indicates some of the mechanisms typically used for financing the local share for airport projects. An early determination should be made as to the most desirable and feasible approach to initiate implementation. The only long-term satisfactory way to resolve concerns regarding financing is through a strong statement of airport financial policy and aggressive implementation of that policy. For this reason, it is essential that a financial policy and program be established and monitored regularly. It should be recognized that the fees and charges levied will be less than possible with private facilities because public agencies can receive Federal funding for facility development.

The estimated Oakdale Municipal Airport Financial Analysis, presented on the Cash Flow Analysis Table 31, are key elements of the study. Through this analysis, the capital improvement program and the projection of annual operating income and expenses are brought together to establish an estimate of the future financial condition over the twenty year planning period for the airport.

TABLE 31
CASH FLOW ANALYSIS
OAKDALE MUNICIPAL AIRPORT
(IN 000'S OF 1995 $'S)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
INCOME																					
Leases - Land/Bldgs	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9
New T-Hangars(City Owned)	0.0	14.7	16.8	16.8	16.8	16.8	28.6	28.6	28.6	28.6	40.8	40.8	40.8	40.8	40.8	40.8	52.6	52.6	52.6	52.6	64.5
Old T-Hangars (City Owned)	9.6	12.0	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
Old Unit Hangars (City Owned)	1.2	1.5	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Portable Hangar Land Leases	4.3	5.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Unit Hangar Land Leases	5.4	6.8	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Tie-Downs (City Owned)	2.4	1.4	2.4	2.9	3.4	3.8	1.9	2.4	2.9	3.4	2.4	2.9	3.4	3.8	4.3	2.9	3.4	3.8	4.3	4.8	2.9
Fuel Flowage	10.7	11.2	11.4	11.6	11.8	12.0	12.2	12.4	12.6	12.8	13.4	13.6	13.8	14.0	14.2	14.6	14.8	15.0	15.2	15.4	15.6
Aircraft Tax Revenue	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.7	6.8	6.9	7.0	7.1	7.3	7.4	7.5	7.6	7.7	8.0
Transient Tiedown Fees	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Subtotal	56.4	76.0	84.5	85.3	86.1	86.8	87.2	88.0	88.8	89.6	111.6	112.4	113.2	113.9	114.7	125.9	126.7	127.4	128.2	129.0	141.0
Annual State Allocation	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
TOTAL INCOME	66.4	86.0	94.5	95.3	96.1	96.8	107.2	108.0	108.8	109.6	121.6	122.4	123.2	123.9	124.7	135.9	136.7	137.4	138.2	139.0	151.0
EXPENSES																					
Salaries	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Maintenance	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Supplies/Other	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Insurance	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Utilities	17.0	17.0	17.0	17.0	17.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Loan Repayment	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Misc	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Subtotal	50.6	50.6	50.6	50.6	50.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6
TOTAL EXPENSES	50.6	50.6	50.6	50.6	50.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6	54.6
PROFIT (LOSS)	15.8	35.4	43.9	44.7	45.5	42.2	52.6	53.4	54.2	55.0	67.0	67.8	68.6	69.3	70.1	81.3	82.1	82.8	83.6	84.4	96.4
CAPITAL REQUIREMENTS																					
FAA/State Grants	0.0	306.3	270.0	354.4	446.3	576.5	375.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.6	0.0	0.0	0.0	0.0
Local Capital	62.5	110.2	30.0	39.4	49.6	64.2	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	65.7	0.0	0.0	0.0	0.0	83.6
Total	62.5	637.5	300.0	393.8	495.8	642.7	375.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	113.3	0.0	0.0	0.0	0.0	83.6
ANNUAL CASH FLOW	-36.7	-95.8	13.9	5.3	-4.0	-22.0	52.6	53.4	54.2	55.0	-33.0	67.8	68.6	69.3	70.1	-14.4	82.1	82.8	83.6	84.4	2.8
ACCUMULATED CASH FLOW	-36.7	-132.5	-118.6	-113.3	-117.3	-139.3	-86.7	-33.3	20.9	75.9	42.9	110.7	179.3	248.6	318.7	304.3	386.4	469.2	552.8	637.2	639.8

SOURCE: WADELL ENGINEERING CORPORATION
OAK-FP2.WK4

The Cash Flow Analysis is stated in terms of constant 1995 dollars and is based on several components:

- Operating income
- Operating expense
- Operating profit/loss
- Capital requirements
- Annual cash flow
- Accumulative cash flow

A philosophy and fee schedule must be established in order to assure that adequate operating income is collected. It is necessary to generate significant revenue at the airports to provide for matching of FAA and state grants in order to implement the capital improvement program. The underlying assumption for the income schedule is that the local pilots and other users sincerely desire development of new airfield and terminal facilities, and are willing to pay appropriate fees.

The Oakdale Municipal Airport competes with other airports in the region for receiving Federal and State aid. Only airports with available grant matching funds can receive grants. Revenue must be generated on the airports with the intent that it will be returned to local users in the form of grants for land acquisition and capital improvements.

The Oakdale Municipal Airport is a major asset to the City. In order to achieve full potential, the airport needs to generate revenues. Sound lease policies and rate structures must be established with the goal of providing sufficient revenues so that the airport can meet its house-keeping responsibilities and develop a reserve for future expansion.

Table 32
Major Revenue Assumptions

Tiedowns: Based	$20/month, increasing to $40
Tiedowns: Transient	$4/night (average), increasing to $5
Hangars:	
New	$175/month, increasing to $200
Old T-hangars	$50/month, increasing to $75
Hangar Land Leases	$30/month, increasing to $60

Source: Wadell Engineering Corporation

The operating income is comprised of apron tiedowns, transient aircraft parking fees, new T-hangars, old T-hangars, hangar land leases, fuel flowage fees, and airport leases (land and buildings). The income from land and building leases was established by analyzing each active lease on the airport and identifying its renewal period and any designated changes in rates and charges. New prevailing rates and charges were assumed to be established based on lease rates currently in effect.

New hangar construction is planned for the airport throughout the planning period. New hangar revenue will be a major source of income for the City through the collection of hangar rental fees. Lease rates on these hangars should be set so that the revenue produced will offset the cost of construction and provide a capital recovery fund.

The operating expenses for the airport are comprised primarily of salaries, maintenance labor and supplies, insurance, utilities, and miscellaneous. The greatest single expense is salaries for day-to-

day operation and management of the airport. It is assumed that there will be no increases in salaries since the current level of staffing is adequate, and 1995 dollars are being used. Maintenance related labor is expended as necessary; it is assumed that there would be no increase in both maintenance labor and associated supplies because the airport is being maintained and reconstructed with FAA overlay and sealcoat projects. While it might be expected that maintenance costs would increase rapidly due to aging facilities, the capital improvement program provides for reconstruction of eligible airport paving and lighting systems thereby precluding the expense of major maintenance programs.

Utilities will increase primarily for electricity related to additional lighting at the airport when the runway and taxiway system is expanded. Miscellaneous costs include attendance by airport management at conferences, special programs initiated by the airport, and other professional and community related activities. This expense will remain constant.

The major expense assumptions and their increases are listed in the following table.

Table 33
Major Expense Assumptions

Salaries	-	$13,800/year, no increase
Airport Maintenance	-	$2,000/year, no increase
Supplies	-	$1,300/year, no increase
Insurance	-	$9,900/year, no increase
Utilities (excludes tenants)	-	$17,000/year increase to $21,000/year in 2000
Miscellaneous Expenses	-	$1,000/year, no increase

Source: Wadell Engineering Corporation

For the purpose of the Financial Analysis, the specific assumptions were made for income and expenditures. However, there are also a series of generalized assumptions underlying the entire analysis.

- The forecast activity levels will occur as projected in this report.
- No capital improvement expenditures in addition to those presented in the report will be required.
- Improvements will be financed to the extent possible with Federal and State funds (assumed to be 90 percent of eligible items).
- All 1995 dollars are used for income, expenses, capital improvements, and land acquisition costs during the 20-year period.
- Specific analysis will be made prior to major commitments, and the airport cost accounting system and development plan will be monitored and updated as necessary.

Based on the revenue and expense assumptions, the annual income and expenses were combined to determine the operating profit (loss). When the operating profit (loss) is coupled with the local share of new capital requirements, the cash flow results. It is apparent that the new revenues and the collection of current revenues generate an operating profit continuing for each year through the year 2015. When combined with the City share of new capital to match grants for land acquisition and capital improvements, there is a positive annual cash flow commencing in 1997, except for 3 years when large capital projects occur. The cash flow remains positive on an accumulative basis for all future years.

The cash flow analysis utilizes current dollars and airport operations on a "cash basis." Sources of financing have not been applied, such as state loans for hangar development and other facilities. Therefore, by the dates mentioned above, the airport has been reconstructed, expanded, and new revenue-producing City hangars developed and paid for out of operating profit. After the planning period, there would not be any significant FAA/State and local capital requirements other than maintenance and repair of facilities as they age. The years beyond the planning period, under the Master Plan assumptions, would yield annual operating profits of the magnitude indicated in the Cash Flow Analysis tables.

Two vital assumptions used in the Cash Flow Analysis tables are (1) the willingness and cooperation of the based aircraft owners to pay new fees to the airport fund and (2) the FAA and state funding will occur and will be 90 percent of all eligible items.

The financial program for the continued development of the Oakdale Municipal Airport should allow operation of the airport in order to obtain reasonable revenue from airport users and to recover operating expenses, financial expenses, and depreciation; to maintain adequate reserves for protection against unpredictable contingencies; and to provide for future improvements and capital equipment.

Based on review of the Cash Flow Analysis tables, it is necessary to obtain maximum FAA and State funding and to meet cash flow requirements on a yearly basis, otherwise projects will be delayed. It is assumed that the City of Oakdale will continue to own and operate the airport. The estimated amount of annual funds would be that amount shown as "annual cash flow." Short term bonds or municipal loans could be used to average high and low annual local funding requirements. State loans for hangar development can provide sufficient funds at a relatively low interest rate.

Implementation Schedule

The efforts in the planning process are brought to fruition through acceptance of the Master Plan, followed by implementation steps that include incorporation into the general plan, updating of zoning, and seeking grant funds. The FAA reviews both the Master Plan and the Airport Layout Drawing (ALD). The Airport Layout Drawing approval occurs after completion of the FAA review and coordination among the divisions of the FAA.

The implementation schedule for the Stage I capital improvements is shown in the following table. The Stage I capital improvements recommended in the Stage Development Program are to be implemented (1) as requirements for facilities arise, and (2) in a manner consistent with the financial capabilities of the City.

Table 34
Implementation Schedule
Oakdale Municipal Airport

STAGE I ACTIVITIES	INITIATION DATE
FAA/State Grant Applications	Winter 1995
Hangar/Fuel Farm Construction	Spring 1996
Irrigation Channel Structure	Summer 1996
Land Acquisition	Spring 1997
Runway System Extension	Summer 1998

Source: Wadell Engineering Corporation

APPENDIX A: GLOSSARY

APPENDIX A
GLOSSARY

Aircraft Approach Category. A grouping of aircraft based on 1.3 times stall speed in a landing configuration at maximum certificated landing weight. The categories are A, B, C, D, and E.

Airplane Design Group (ADG). A grouping of airplanes based on wingspan. The groups are I, II, III, IV, V, and VI.

Airport Elevation. The highest point on an airport's usable runway expressed in feet above mean sea level (MSL).

Airport Layout Plan (ALP). The plan of an airport showing the layout of existing and proposed airport facilities.

Airport Reference Code (ARC). A coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. The code has two components relating to the airport design aircraft. The first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed. The second component, depicted by a Roman numeral, is the airplane design group and relates to airplane wingspan.

Airport Reference Point (ARP). The latitude and longitude of the approximate center of the airport.

Blast Fence. A barrier used to divert or dissipate jet blast or propeller wash.

Building Restriction Line (BRL). A line which identifies suitable building area locations on airports.

Clearway (CWY). A defined rectangular area beyond the end of a runway cleared or suitable for use in lieu of runway to satisfy takeoff distance requirements.

Compass Calibration Pad. An airport facility used for calibrating an aircraft compass.

Declared Distances. The distances are:

Takeoff run available (TORA) - the runway length available for takeoff.

Takeoff distance available (TODA) - the runway length available for takeoff plus the length of available clearway (CWY).

Accelerate-stop distance available (ASDA) - the runway length available for takeoff plus the length of available stopway (SWY).

Landing distance available (LDA) - the runway length available for landing.

Hazard to Air Navigation. An object that the FAA determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential airport capacity.

Heavy Airplane. An airplane weighing more than 255,000 pounds maximum certificated takeoff weight.

Large Airplane. An airplane weighing more than 41,000 pounds maximum certificated takeoff weight, but less than 255, 000 pounds.

Object. Includes, but is not limited to above ground structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain, and parked aircraft.

Object Free Area (OFA). A two dimensional ground area surrounding runways, taxiways, and taxilanes which is clear of objects except for objects whose location is fixed by function.

Obstacle Free Zone (OFZ). The airspace defined by the runway OFZ and, as appropriate, the inner-approach OFZ and the inner-transitional OFZ, which is clear of object penetrations other than frangible NAVAIDs.

Runway OFZ - the airspace above a surface centered on the runway centerline.

Inner-approach OFZ - the airspace above a surface centered on the extended runway centerline. It applies to runways with an approach lighting system.

Inner-transitional OFZ - the airspace above the surfaces located on the outer edges of the runway OFZ and the inner-approach OFZ. It applies to precision instrument runways.

Obstruction to Air Navigation. An object of greater height than any of the heights or surfaces presented in Subpart C of FAR Part 77. Obstructions to air navigation are presumed to be hazards to air navigation until an FAA study has determined otherwise.

Runway (RW). A defined rectangular surface on an airport prepared or suitable for the landing or takeoff of airplanes.

Runway Blast Pad. A surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

Runway Protection Zone (RPZ). An area, formerly the clear zone, used to enhance the safety of aircraft operations. It is at ground level beyond the runway end.

Runway Safety Area (RSA). A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Runway Type. A runway use classification related to its associated aircraft approach procedure. The runway types are:

Visual runway - a runway without an existing or planned straight-in instrument approach procedure.

Nonprecision instrument runway - a runway with an approved or planned straight-in instrument approach procedure which has no existing or planned precision instrument approach procedure.

Precision instrument runway - a runway with an existing or planned precision instrument approach procedure.

Shoulder. An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface, support for aircraft running off the pavement, enhanced drainage, and blast protection.

Small Airplane. An airplane weighing 41,000 pounds or less maximum certificated takeoff weight.

Stopway (SWY). A defined rectangular surface beyond the end of a runway prepared or suitable for use in lieu of runway to support an airplane, without causing structural damage to the airplane, during an aborted takeoff.

Taxilane (TL). The portion of the aircraft parking area used to access taxiways and aircraft parking positions.

Taxiway (TW). A defined path established for the taxiing of aircraft from one part of an airport to another.

Taxiway Safety Area (TSA). A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

Threshold (TH). The beginning of that portion of the runway available for landing. When the threshold is located at a point other than at the beginning of the pavement, it is referred to as either a displaced or a relocated threshold depending on how the pavement behind the threshold is used.

Displaced threshold - the portion of pavement behind a displaced threshold is available for takeoffs in either direction and landings from the opposite direction.

Relocated threshold - the portion of pavement behind a relocated threshold is not available for takeoff or landing. It may be available for taxiing of aircraft.

Transport Airport. An airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Category C and D.

Utility Airport. An airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Category A and B.

APPENDIX B: AIRPORT DRAWINGS

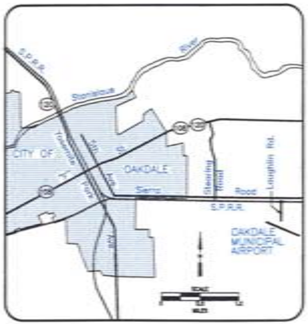
OAKDALE MUNICIPAL AIRPORT

AIRPORT LAYOUT PLAN DRAWINGS

A CITY OF OAKDALE AVIATION FACILITY
OAKDALE, CALIFORNIA

AIRPORT IMPROVEMENT PROGRAM
PROJECT NO. 3-06-0168-02

LOCATION MAP



INDEX:

SHEET	
1	AIRPORT LAYOUT DRAWING
2	TERMINAL AREA DRAWING
3	APPROACH & RUNWAY PROTECTION ZONE DRAWING
4	STAGE DEVELOPMENT DRAWING
5	AIRPORT PROPERTY MAP

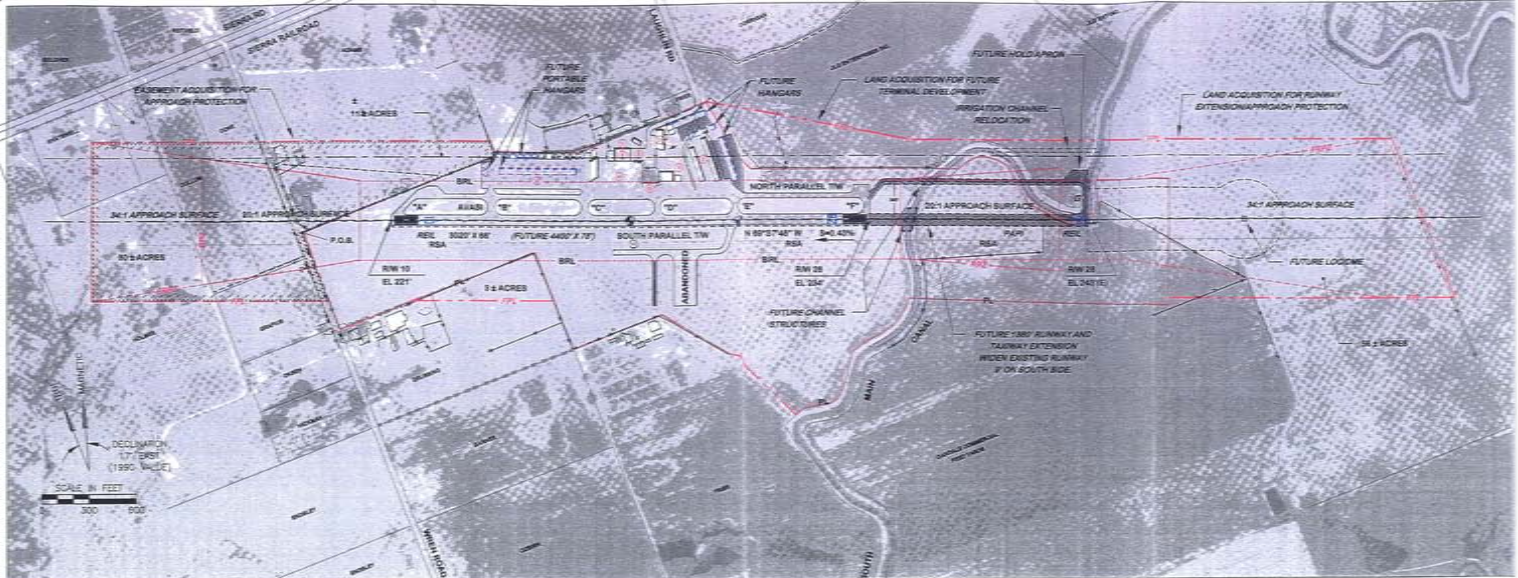
VICINITY MAP

OAKDALE MUNICIPAL AIRPORT
A CITY OF OAKDALE AVIATION FACILITY
OAKDALE CALIFORNIA

TITLE SHEET

SHEET - / - SHEETS
SCALE AS SHOWN
DATE OCT 1992
DRAWN DLH
DESIGNED RPW

WADELL ENGINEERING CORPORATION AIRPORT PLANNING - ENGINEERING - MANAGEMENT san francisco bay area



LEGEND

	EXISTING	FUTURE
AIRPORT REFERENCE POINT		
AIRPORT PROPERTY LINE	—PL—	—FPL—
AVIATION EASEMENT		
BUILDING RESTRICTION LINE	—BRL—	—BRL—
RUNWAY SAFETY AREA	—RSA—	—RSA—
RUNWAY PROTECTION ZONE	—RPZ—	—FRPZ—
BUILDINGS		
DRAINAGE		
PAVEMENT		
FACILITY TO BE REMOVED	N/A	X
FENCE		
LIGHTING		
WIND CONE		

FACILITY DATA

1	AIRPORT BEACON/PANEL
2	HANGARS
3	FBO
4	APRON
5	AUTO PARKING
6	FUEL FARM
7	WASH RACK
8	
9	
10	
11	
12	
13	

AIRPORT DATA

		EXISTING	FUTURE
AIRPORT REFERENCE CODE		A-I	B-II
ELEVATION (MSL)		224'	242'
TEMPERATURE (MEAN MAX. OF HOTTEST MONTH)		97°F	SAME
REFERENCE POINT COORDINATES	LATITUDE	N 37°45'23"	N 37°45'26"
	LONGITUDE	W 120°48'01"	W 120°47'46"
NAVIGATIONAL AIDS		VOR/DME	LOCALIZER/DME
ACREAGE	FEE TITLE	[illegible]	[illegible]
	AVIATION EASEMENT	21.2	41
BASED AIRCRAFT PARKING DEMAND	TIEDOWNS	20	[illegible]
	HANGARS/SHELTERS	35	64
	TOTAL	55	[illegible]
TRANSIENT AIRCRAFT TIEDOWN DEMAND		7	10
AIRPORT RESCUE & FIRE FIGHTING INDEX (ARFF)		N/A	N/A

TAXIWAY DATA

T/W	TYPE	PAVEMENT SURFACE	PAVEMENT WIDTH EXISTING	PAVEMENT WIDTH FUTURE	STRENGTH (1000#) SINGLE GEAR EXISTING	STRENGTH (1000#) SINGLE GEAR FUTURE	SIGNING/LIGHTING EXISTING	SIGNING/LIGHTING FUTURE
A	PARALLEL	A.C.	30'	25'	20	30	MTL	SAME
B	EXIT	A.C.	40'	SAME	20	30	MTL	SAME
C	EXIT	A.C.	40'	SAME	20	30	MTL	SAME
D	EXIT	A.C.	30'	25'	20	30	MTL	SAME
E	EXIT	A.C.	30'	25'	20	30	MTL	SAME
F	EXIT	A.C.	30'	25'	20	30	MTL	SAME
G	EXIT	A.C.	–	25'	–	30	–	MTL

RUNWAY DATA

			RUNWAY 10-28 EXISTING	RUNWAY 10-28 FUTURE
AIRPORT REFERENCE CODE			A-I	B-II
RUNWAY CLASSIFICATION			B.U.-I	GENERAL UTILITY II
PHYSICAL LENGTH AND WIDTH			3020'x66'	4400'x75'
THRESHOLD DISPLACEMENT (D) OR RELOCATION (R)			NONE	NONE
EFFECTIVE GRADIENT (%)			0.40	0.30
PAVEMENT STRENGTH (1000#) SINGLE GEAR			20	30
LIGHTING			MIRL/MARS	HIRL/PAPI
MARKING			NON-PRECISION	SAME
CRITICAL AIRCRAFT	RUNWAY LENGTH		[illegible]	[illegible]
	PAVEMENT STRENGTH		[illegible]	SAME
	WINGSPAN		[illegible]	[illegible]
APPROACH TYPE	10		NON-PRECISION	NON-PRECISION
	28		VISUAL	NON-PRECISION
APPROACH SLOPE, REQUIRED/CLEAR	10		20:1/50:1	34:1/50:1
	28		20:1/50:1	34:1/50:1
APPROACH & LANDING AIDS	10		VOR/DME	LOC/DME
	28		NONE	VOR/DME
RUNWAY END COORDINATES	10	LAT.	N 37°45'28"	SAME
		LONG.	W 120°48'14"	SAME
	28	LAT.	N 37°45'19"	N 37°45'17"
		LONG.	W 120°47'38"	W 120°47'20"
RUNWAY SAFETY AREA DIMENSIONS	WIDTH		120'	300'
	LENGTH (BEYOND END)		240'	600'
RUNWAY PROTECTION ZONE DIMENSIONS (INNER/OUTER/LENGTH)	10		500/800/1000	500/1010/1700
	28		500/800/1000	500/1010/1700
WIND COVERAGE (%)	12 MPH ALL WEATHER		97.3	SAME
	15 MPH ALL WEATHER		98.2	SAME

FAA APPROVAL

CITY OF OAKDALE

By: ________ Date: ________
Title: ________

By: ________ Date: ________
Title: ________

NOTES

1. ALL AIRFIELD PAVEMENTS ARE ASPHALTIC CONCRETE.
2. SITING OF NAVAIDS AND LIGHTING AIDS SUBJECT TO FAA REVIEW AND DESIGN.
3. TOPOGRAPHY SOURCE MAY 1994 MAPPING.
4. THE AIRPORT IS NOT SUBJECT TO FLOODING.
5. NO AIRPORT HEIGHT ZONING ORDINANCE IS IN EFFECT.
6. CLEAR SLOPES ARE BASED ON ANALYSIS OF MAY 1994 MAPPING TOPOGRAPHY.
7. THE 300' RSA PRESERVED FOR ULTIMATE ILS. FUTURE RSA IS 150' WIDE.
8. WIDEN RUNWAY ON SOUTH SIDE TO INCREASE TAXIWAY SEPARATION.

THE PREPARATION OF THIS DOCUMENT WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THE REPORT BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREON NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

OAKDALE MUNICIPAL AIRPORT
A CITY OF OAKDALE AVIATION FACILITY
OAKDALE CALIFORNIA

AIRPORT LAYOUT DRAWING

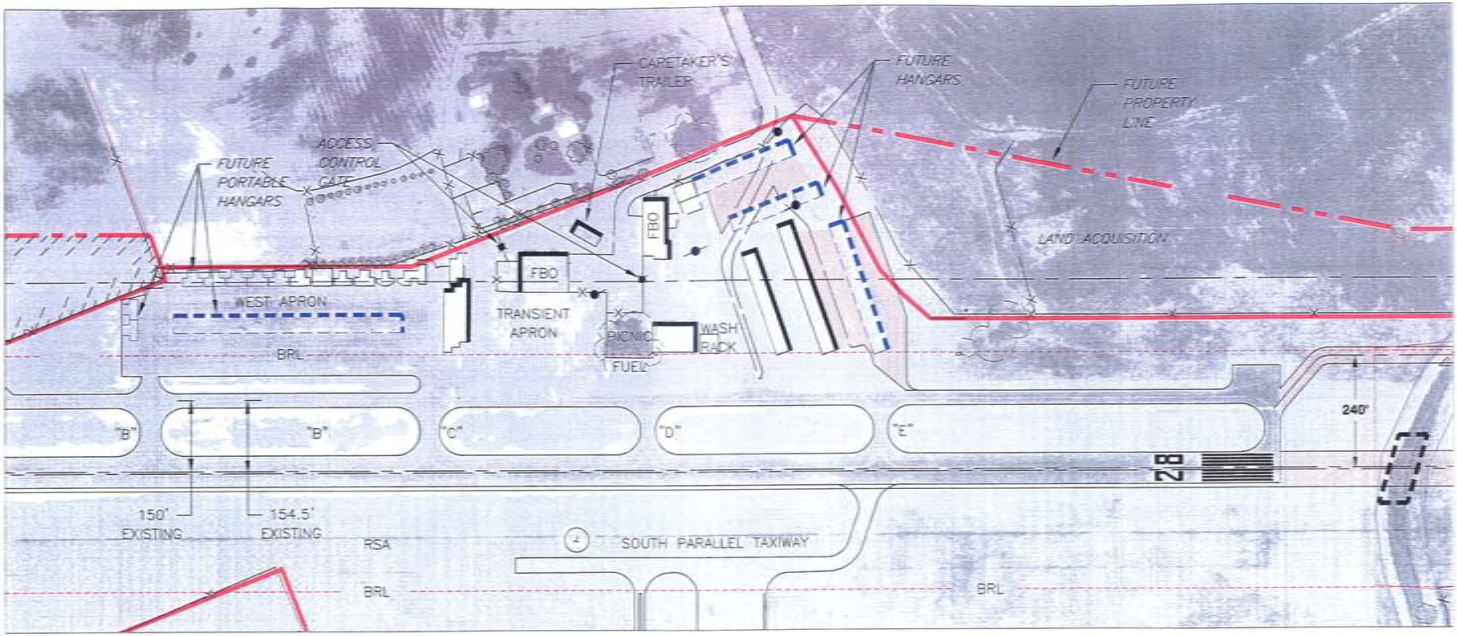
SHEET 1 / 5 SHEETS

SCALE AS SHOWN
DATE OCT 1995
JOB NUMBER 1195 DRAWING NUMBER 195-1ALD

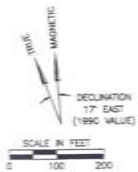
195-1ALD 12-10-97 (1=300) REF: OAK-ALD

WADELL ENGINEERING CORPORATION

AIRPORT PLANNING - ENGINEERING - MANAGEMENT san francisco bay area



LEGEND		
	EXISTING	FUTURE
AIRPORT REFERENCE POINT		
AIRPORT PROPERTY LINE		
AVIATION EASEMENT		
BUILDING RESTRICTION LINE		
RUNWAY SAFETY AREA		
RUNWAY PROTECTION ZONES		
BUILDINGS		
DRAINAGE		
FACILITIES		
FACILITY TO BE REMOVED	n/a	X
FENCE		
LIGHTING		
RPZ/ CZ/		



OAKDALE MUNICIPAL AIRPORT
A CITY OF OAKDALE/MACON PROJECT
OAKDALE CALIFORNIA

TERMINAL AREA DRAWING

SHEET 2 / 5 SHEETS

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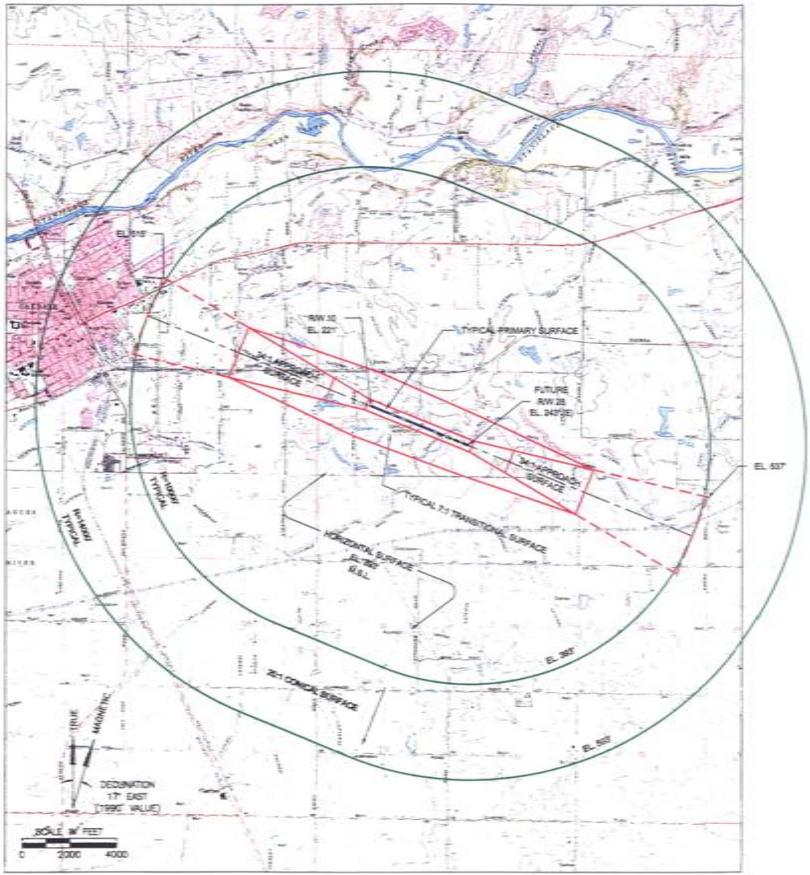
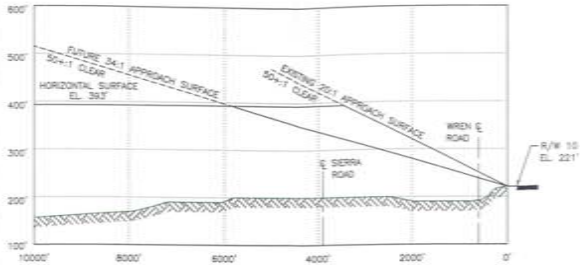
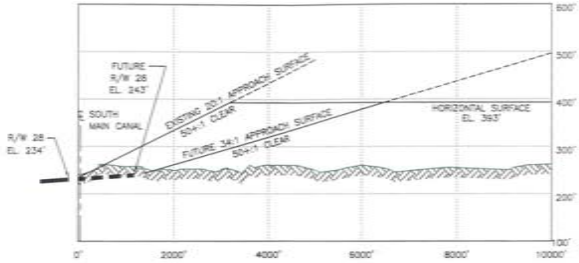
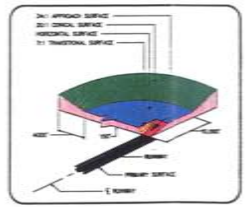






ISOMETRIC VIEW



NOTES:

- THIS PLAN PRESERVES AND PROTECTS FOR NON-PRECISION INSTRUMENT APPROACHES TO A HIGH FUTURE RUNWAY 10-28.
- THERE ARE NO PENETRATIONS TO THE APPROACH, TRANSITIONAL, HORIZONTAL AND CONICAL SURFACES. THE PROFILES REPRESENT A COMPOSITE OF THE HIGHEST TERRAIN IN THE APPROACH ZONE.
- BASE MAP: CURRENT U.S.G.S. MAPS.
- AIRPORT ELEVATION IS 243 FEET MSL. AIRPORT REFERENCE POINT COORDINATES ARE ESTIMATED AS FOLLOWS:

	EXISTING	FUTURE
LATITUDE	N 37°45'23"	N 37°45'26"
LONGITUDE	W 120°47'01"	W 120°47'46"

- FAR PART 77 HEIGHT RESTRICTIVE ZONING IS CURRENTLY IN EFFECT.

OAKDALE MUNICIPAL AIRPORT
A CITY OF OAKDALE AVIATION FACILITY
OAKDALE CALIFORNIA

APPROACH & RUNWAY PROTECTION ZONE DRAWING

SHEET 3 / 5 SHEETS

SCALE AS SHOWN

DATE OCT. 1996

JOB NUMBER 1195 DRAWING NUMBER 195-3APC

DRAWN DLH CHECKED DATE BPH

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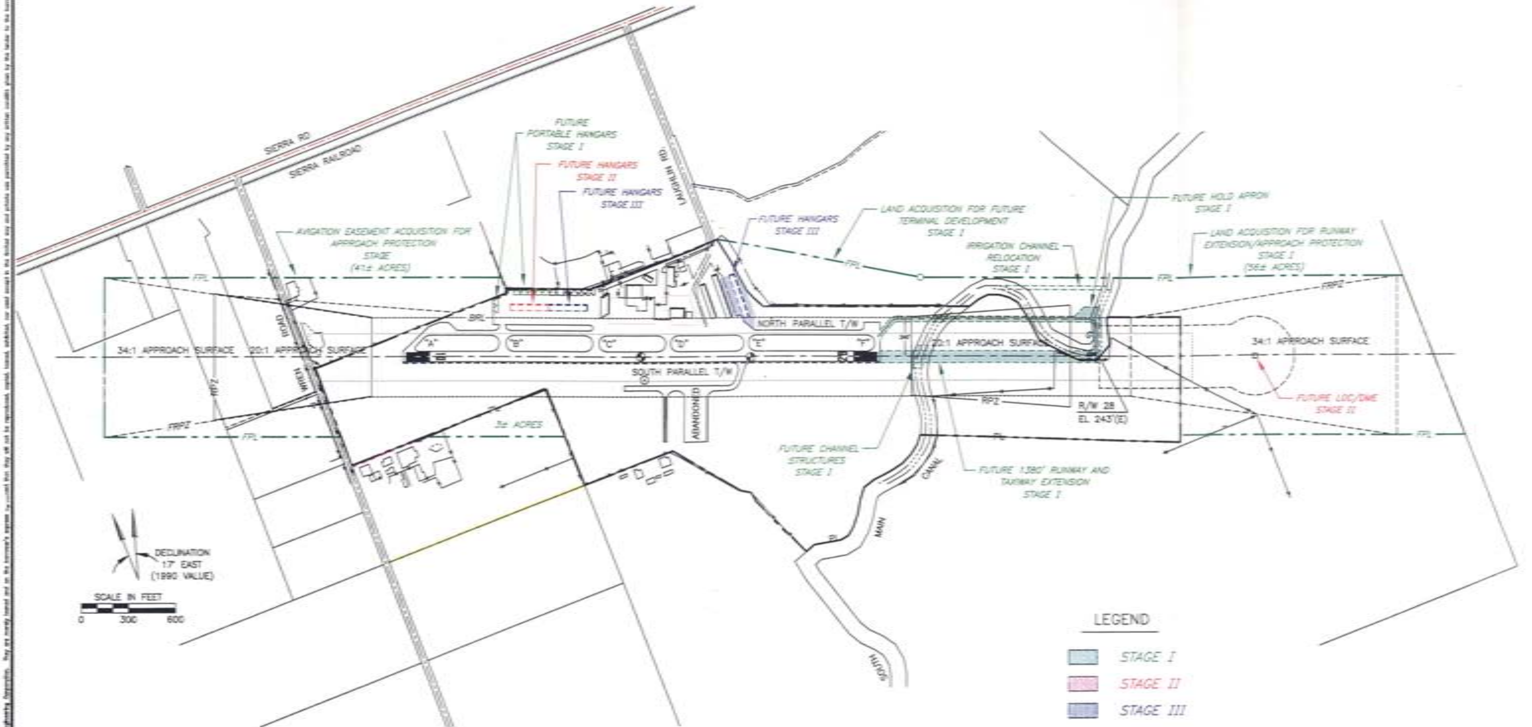

OAKDALE MUNICIPAL AIRPORT
A CITY OF OAKDALE AVIATION FACILITY
OAKDALE CALIFORNIA

STAGE DEVELOPMENT DRAWING

SHEET 4/5 SHEETS

SCALE AS SHOWN

DATE OCT 1995

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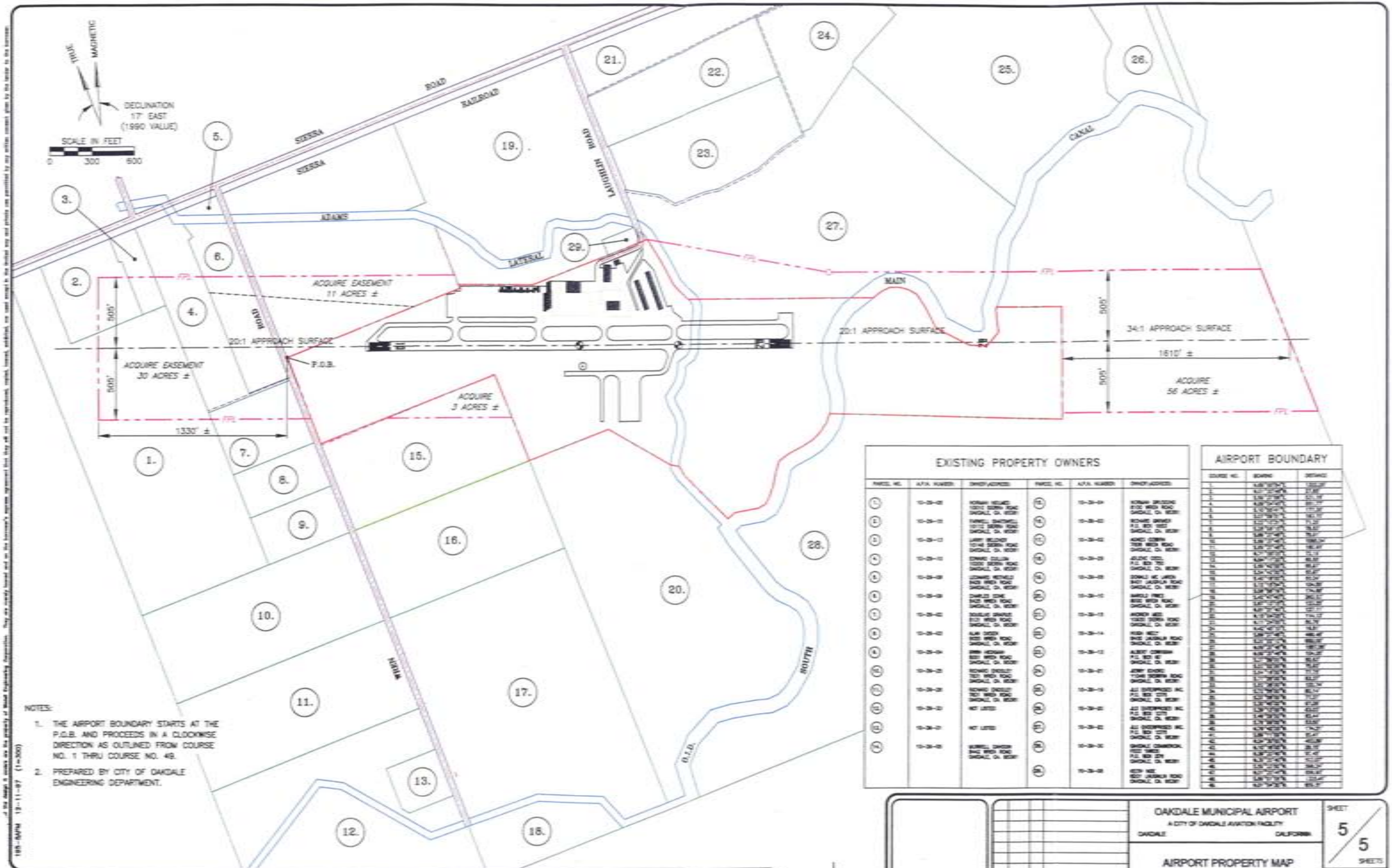

NOTES:

1. THE AIRPORT BOUNDARY STARTS AT THE P.O.B. AND PROCEEDS IN A CLOCKWISE DIRECTION AS OUTLINED FROM COURSE NO. 1 THRU COURSE NO. 49.
2. PREPARED BY CITY OF OAKDALE ENGINEERING DEPARTMENT.

EXISTING PROPERTY OWNERS

PARCEL NO.	A.P.N. NUMBER	OWNER/ADDRESS	PARCEL NO.	A.P.N. NUMBER	OWNER/ADDRESS
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

AIRPORT BOUNDARY

COURSE NO.	BEARING	DISTANCE
[illegible]	[illegible]	[illegible]

OAKDALE MUNICIPAL AIRPORT
A CITY OF OAKDALE AVIATION FACILITY
OAKDALE CALIFORNIA

AIRPORT PROPERTY MAP

SHEET 5 / 5 SHEETS

SCALE AS SHOWN

DATE OCT 1995

DRAWN DLH | DESIGNED RPW | JOB NUMBER 1195 | DRAWING NUMBER 195-5APM

195-5APM 12-11-97 (1=300)

WADELL ENGINEERING CORPORATION AIRPORT PLANNING - ENGINEERING - MANAGEMENT san francisco bay area